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Sixth Biennial Report 48

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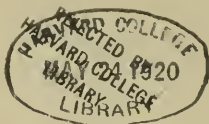
OF THE

State Board of Health
And Vital Statistics

OF MINNESOTA

1914-1915

SYNDICATE PRINTING CO.,
Minneapolis, Minn.
1917



The Board

Office of the State Board of Health and Vital Statistics,
St. Paul, Minn., December 12, 1916.

To His Excellency J. A. A. Burnquist, Governor of Minnesota.

Sir: In accordance with the law which requires that the Minnesota State Board of Health "shall report its doings and discoveries to the legislature at each regular session thereof, with such recommendations as it shall deem useful," I herewith submit to you a report covering the calendar years 1914-1915.

Respectfully submitted,
H. M. BRACKEN, M. D.,
Secretary and Executive Officer.



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Introduction

Ten years ago Minnesota stood second to no state in the Union in public health work. Massachusetts exceeded along some special lines at that time; Minnesota in others. Honors between these two states were easy.

Pennsylvania, which had little to show for public health prior to 1905, reorganized its health department and made an exceedingly liberal appropriation for carrying on the work. New York state had little to show for public health work until its reorganization in 1913. Massachusetts reorganized its public health department in 1914. Minnesota has been plodding along and making the best possible showing on a very low appropriation.

According to a recent review of public health activities in the various states, Minnesota holds fourth place in efficiency in spite of its exceedingly low appropriation. The record for certain states on a possible score of 1,000 is as follows:

Massachusetts	745	Ohio	462
New York.....	730	Wisconsin	392
Pennsylvania	716	Illinois	346
Minnesota	574	California	342
New Jersey.....	555	Louisiana	315
Indiana	526	Florida	253
Maryland	507	Iowa	225
Kansas	499	North Dakota.....	139
Vermont	486	South Dakota.....	101

Minnesota was given high markings in the following:

	Possible.	Given.
Communicable diseases.....	160	130
Diagnostic laboratory.....	80	74
Vital statistics.....	100	90
Water and sewage control.....	100	70

Minnesota was given low markings in the following:

	Possible.	Given.
Personal supervision.....	60	5
Conferences	20	0
Bulletins	20	10
Child hygiene.....	70	5
Food supplies.....	60	0
Education	100	35

The expenditures of states listed for the year 1913 were as follows:

Pennsylvania	\$1,047,431.66	Louisiana	\$7,491.30
New York.....	284,676.85	Minnesota	72,013.31
Massachusetts	180,219.14	Indiana	64,719.00
Maryland	142,600.00	Kansas	64,430.00
Illinois	133,919.60	Wisconsin	38,205.63
Florida	129,012.03	Vermont	33,385.50
New Jersey.....	125,942.15	Iowa	32,568.32
California	112,953.48	North Dakota.....	10,569.38
Ohio	91,736.25	South Dakota.....	9,730.00

All of these states except California are smaller than Minnesota. Minnesota stands eleventh among these states in appropriation while fourth in efficiency.

The per capita expenditure in certain states was as follows:

	Cents		Cents
Florida	15.21	New Hampshire	4.81
Pennsylvania	12.70	New Jersey	4.47
Maryland	10.5 [†]	Delaware	4.04
Vermont	9.27	California	3.96
Nevada	7.59	Arizona	3.76
Montana	5.45	Minnesota	3.25
Idaho	5.22	North Dakota	1.48
Massachusetts	4.95	Iowa	1.46
Louisiana	4.93	South Dakota	1.43

It will be noted that Minnesota is fifteenth in this list.

The percentage of total annual revenues of the state set aside for public health in 1913, as shown by reports of the United States Health Service, is as follows:

	Pct.		Pct.
Pennsylvania	2.7	Indiana	.70
Maryland	1.7	Virginia	.70
California	1.7	Rhode Island	.53
Massachusetts	1.54	New York	.53
Vermont	1.37	Michigan	.45
New Jersey	1.3	Connecticut	.38
Oregon	.82	Maine	.37
Kansas	.70	Minnesota	.34

Minnesota, it will be noted, is sixteenth in this list, standing far below many of the states over which it holds pre-eminence as to efficiency.

The appropriations by funds since 1904, for fiscal years beginning August first, have been as follows:

Year	General	Vital Statistics	Contagious Diseases	Laboratory	Sanitary Engineering	Pasteur Institute	Miscellaneous
1904	8,500	1,500	2,500	10,500			
1905	8,500	1,500	2,500	16,000			
1906	9,500	1,500	2,500	11,000			
1907	11,000	1,500	2,500	13,000	1,000	5,000	*500
1908	14,000	3,500	4,500	15,000	1,000	5,000	*500
1909	14,500	3,500	9,500	16,000	2,500	7,500	
1910	14,500	6,500	12,500	18,000	5,500	7,500	
1911	17,000	5,000	12,500	18,000	5,000	5,000	
1912	17,000	8,000	13,500	19,000	7,500	7,000	
1913	14,500	5,000	15,000	18,000	7,000	7,000	
1914	14,500	5,000	15,000	18,000	7,000	7,000	\$8,000
1915	14,500	5,000	15,000	20,000	7,000	7,000	‡500
1916	14,500	5,000	15,000	20,000	7,000	7,000	‡500

*Examination of embalming fluids.

†Antitoxin.

‡Contagious disease carrier.

§Special; to complete fiscal year ending July 31, 1915.

The advances made by this Board since its organization are indicated in the following sketch:

The Board was organized on petition of the State Medical Society, March, 1872. It was the third State Board of Health in the country, that of Massachusetts, organized in 1869, and of California, organized in 1871, being the first and second, respectively.

In 1873 a department of public health was established at the university, Dr. Hewitt, connected with the State Board of Health, being appointed Professor of Public Health.

In the same year a law was passed providing for local boards of health. In 1883 a law was passed requiring local boards of health to report

to the State Board of Health, thus bringing these two in direct relationship with each other. A sanitary conference of state and local boards of health was first held in 1885.

In 1873 chemical examinations were first made by the secretary, Dr. Hewitt, in a laboratory fitted by him for the Board at Red Wing. In 1877 the Board co-operated with the university in the examination of the waters of the Red River valley, each party bearing half of the expense.

In 1887 and years following, a laboratory assistant was employed to aid the secretary. In 1875 the secretary, Dr. Hewitt, made examinations of kerosene oils. Extensive examinations of these oils were also made in 1883 and 1884. In 1875 the secretary, Dr. Hewitt, made examinations of milk, baking powders and other foods, and this work increased under him until the creation of the State Dairy and Food Department. In 1885, 1887, and 1889 the Board asked for a law against the adulteration of foods and providing for the examination of foods under the State Board of Health. In 1889 a meat inspection law was passed, but this law was rendered ineffective by the rulings of the court.

In 1889 Dr. Hewitt, the secretary, was sent abroad to prepare himself for work in bacteriology, vaccine production, and sewage and garbage disposal for the Board, and on his return he established a bacteriological laboratory at Red Wing where examinations were made by him for malignant catarrh (cattle), glanders (horses), tuberculosis (animals), trichina, pleuropneumonia, etc. Examinations for human tuberculosis were begun in 1891.

In 1890 a station for the production of vaccine virus was established by order of the Board, at Red Wing. This station was continued in operation until the retirement of Dr. Hewitt as secretary in 1897.

The laboratories of the Board (chemical and bacteriological) were removed from Red Wing to the Mechanic Arts Building of the University in 1893. In 1894 regular bacteriological examinations for diphtheria and tuberculosis were begun. Instructions were given to medical students of the university in this laboratory. The same year an assistant bacteriologist was employed. In 1894 the secretary recommended to the Board that it should produce diphtheria antitoxin and mallein.

In 1896 Dr. F. F. Westbrook was appointed a member of the Board and made bacteriologist. A new laboratory was fitted up in a building connected with the medical department of the university and the bacteriological work transferred from the laboratory in the Mechanic Arts building under Dr. Hewitt to Dr. Westbrook. The chemical work was continued under Dr. Hewitt until his retirement in January, 1897.

Infectious diseases of animals were placed under the control of this Board in 1885. In 1897 two departments were created, known as the Bacteriological Department and the Infectious Diseases of Animals Department. The former was placed under the directorship of Dr. F. F. Westbrook, the latter under the directorship of Dr. M. H. Reynolds upon his appointment as a member of the Board, with offices at the Experiment Station at St. Anthony Park. In 1900, under the ruling of Governor Lind, this office was moved to the general office of the State Board of Health in St. Paul, and Dr. S. D. Brimhall was made director of the Department of Animal Diseases. In 1903 the legislature created the State Live Stock Sanitary Board, transferring the control of infectious diseases of animals from the State Board of Health to said Board.

In 1897 Professor Bell, chemist of the medical department of the University of Minnesota, was urged to take up the chemical work for the Board as Dr. Westbrook had taken up the bacteriological work. This Professor Bell was not willing to do. It was therefore assigned to his assistant, Mr. Carel, who continued to do the chemical work for the Board in the laboratory of the medical department of the University until 1904.

Work relating to sanitary engineering began as early as 1876, a sanitary inspection of the construction and equipment of buildings owned by the state being first made in that year. Similar inspections were made in

years following. In 1901 Mr. George L. Wilson was employed intermittently to do engineering work for the Board. Later Professor J. J. Flather was likewise employed. In 1906 Professor F. H. Bass was employed on a regular salary basis to give part of his time to the sanitary engineering work of the Board. In 1910, a Division of Engineering was created and Professor Bass was made director, giving part of his time to the Board, still continuing his services as professor at the university.

A branch laboratory for the Board was established at Duluth in July, 1905; a second branch laboratory at Mankato in 1912.

In 1907 the Board thought it wise to give special attention to the subject of tuberculosis and proposed that it co-operate with the Association for the Study and Prevention of Tuberculosis, just created, to the extent of half the salary and expenses of a competent man to have charge of this work. Mr. C. Easton was employed in this capacity, the State Board of Health paying all of his salary and expenses to begin with, it being understood that as he built up the state association it would assume its share of the responsibilities. An exhibit for the International Congress on Tuberculosis at Washington was prepared in 1908 and this was further developed into a traveling exhibit which was kept on the road until 1914, when it was discontinued because of lack of funds. Mr. Easton resigned his position in the Board in 1909. The work has since been carried on under those in employ of the Board entirely, there having been no co-operation between the State Board of Health and the Association as was originally intended.

The establishment of a Pasteur Institute was recommended by the Board and its secretary, Dr. Hewitt, in 1892, but not until 1907 did the legislature appropriate money for this purpose. The Institute was then established and located in rooms in a building which had been constructed on the university campus for the use of the State Board of Health and the University jointly. Laboratory examinations for rabies were commenced in 1890.

The epidemiological work of the board was carried on by its first secretary, Dr. Hewitt, and by his successor, Dr. Bracken, until 1909, when Dr. H. W. Hill was appointed epidemiologist and devoted special attention to this work. In 1910 the Board created a distinct division for epidemiology with Dr. Hill as director.

The history of the Board covering forty-four years is most interesting, as its high character has been generally recognized and the various governors have, by their appointments, kept the Board not only on a conservative basis but out of politics.

It is worthy of notice that during these forty-four years there have been but five presidents, the first, Dr. A. B. Stuart of Winona, serving but one year, at the end of which time he resigned from the Board. The second, Dr. D. W. Hand of St. Paul, and one of the first members of the Board, served as president until 1889, the time of his death. The third president, Dr. Franklin Staples of Winona, who had been appointed to the board in 1873 following the resignation of Dr. Stuart, served as president from 1889 to 1904, the time of his death. The fourth president, Dr. Henry Hutchinson of St. Paul, who became a member of the board in 1895 was made president in 1904 and served until his death in 1910. The fifth president, Dr. W. A. Jones of Minneapolis, was appointed successor to Dr. Hutchinson in 1910, and is still serving as president.

The record for the secretary and executive officer of the board is quite striking. Dr. C. N. Hewitt of Red Wing, one of the original members of the board, was appointed its secretary in 1872 and served until 1897. His successor, Dr. H. M. Bracken of Minneapolis, was appointed in 1897 and is still serving.

The board at present consists of nine members.

The law provides that the board shall choose its own secretary and executive officer.

The work of the board was carried on at Red Wing from its organization in 1872 until 1894 when the office was moved by action of the Board to rented rooms in the Pioneer Press Building. The Board continued its op-

eration at this point until December, 1904, when it moved into its quarters in the new Capitol Building.

The work of the Board is now carried on in the general office (administrative) and under four divisions as follows: Division of Preventable Diseases, Division of Sanitation, Division of Vital Statistics and Division of Records. These four divisions have been created by the Board for convenience in handling its affairs. Each one is presided over by a director. All employes, including the secretary and executive officer, give their entire time to the Board. While there is a distinct law relating to vital statistics making the secretary of the Board State Registrar, it was thought that it was better to handle this also as a division, and his work is carried on, therefore, under a special division.

When Honorable John Lind became governor in 1899 he expressed himself strongly against individuals receiving salary from two different sources. He appreciated the fact, however, that it was impossible at that time for any change to be made in the conditions under which Dr. Wesbrook and Dr. Bracken were employed by the university and the State Board of Health, it being impossible with the conditions of funds then existing for either the university or the State Board of Health to pay a full salary independently to either one of these men.

In October, 1906, the Board offered Dr. Bracken a salary of five thousand dollars per annum if he would give up his university connection and devote his entire time to the State Board of Health. This the doctor agreed to do, and this change came about January 1, 1907. Dr. Bracken at that time resigning his position as professor of *Materia Medica* and Therapeutics in the Medical Department of the university, a position which he had held for twenty years. It is of interest to note that this salary was the same in amount as that offered to Dr. Hewitt in 1893 when he was requested to give his whole time to the State Board of Health on the removal of its officers from Red Wing to St. Paul.

Following this withdrawal of Dr. Bracken from the university faculty, Dr. Wesbrook was the only one left in the employ of the State Board of Health who was drawing part of his salary from the university. This was changed, however, in 1911 when the engineering division was created, for then Professor Bass was put on the pay roll of the State Board of Health and the University. At the same time that the engineering division was created Dr. Mullin was appointed as director of the Laboratory Division, Dr. Wesbrook resigning, and he continued as Dr. Wesbrook had done, drawing salary partly from the university and partly from the Board.

In the latter part of 1913 Dr. Mullin suggested a rearrangement of the divisions of the Board. This rearrangement was carried out and went into effect August 1, 1914. Under this rearrangement there were two divisions, called the Division of Preventable Diseases and the Division of Sanitation, to take the place of the three divisions, namely, (1) Laboratory Division, (2) Division of Epidemiology, and (3) Division of Sanitary Engineering. Under the Division of Preventable Diseases were grouped (a) the Pasteur Institute, which had previously been carried on under the Laboratory Division, (b) the former Division of Epidemiology, and (c) that portion of the laboratory relating to preventable diseases. Under the Division of Sanitation were grouped (a) sanitary engineering and architectural work, (b) laboratory work relating to the examination of milk and water, (c) sanitary matters relating to water supplies, sewage disposal, etc.

With this change of organization, all employes of the Board were placed upon full-time, drawing salaries only from the Board and having no university connection whatever.

The same year that Dr. Bracken became secretary (1897) the question of transportation of the dead was prominently before health officials, railroad officials, and embalmers. A joint committee was appointed from the Conference of State and Provincial Boards of Health of North America, the National Funeral Directors Association and the General Baggage Agents Association to consider this matter. Certain recommendations were made by this joint committee to the Conference of State and Provincial Boards

of Health, in the fall of 1897. Minnesota at once made provision, under regulations, for the licensing of embalmers, the first examination being held in 1898. This was not a compulsory licensing system, but many of the embalmers in the state took advantage of it. In 1905 a law was passed making the embalmers' license compulsory.

The legislature of 1915 appropriated five thousand dollars a year for the purchase and distribution of free antitoxin. This work was begun with the establishment of antitoxin stations at the various county seats and other important cities and villages throughout the state.

A sanitary survey of the state was made in 1914 by Dr. Carroll Fox, surgeon of the United States Public Health Service. Certain recommendations were made in that survey and presented to the legislature of 1915, but without result.*

The policy of the Board in the future should continue along the present lines with an addition of divisions as suggested by Dr. Fox; namely, a division of child welfare and school hygiene, an extension division, etc.

There is no intermediator now between the State Board of Health and the local boards of health. A policy of creating whole-time district or county health officers should be followed, and there should be whole-time health officers in the larger municipalities as well as for the districts or counties. The legislature of 1911 was asked to pass a bill providing that where a municipality wished for a whole-time health officer and medical school supervisor the State Board of Health should nominate such an individual, to be appointed jointly by the Council and the Board of Education. Upon appointment such individual was to receive a salary, one-third to be paid by the municipality, one-third by the Board of Education, and one-third by the State Board of Health. This bill died in committee. A somewhat similar bill, but with greater elasticity, was presented to the legislature in 1913, providing for a county health officer to be paid in part by the state, in part by the county. This bill, too, died in committee.

It is a fair proposition to consider the possibility of whole-time local health officers free from politics and receiving state aid, for public health administration is comparable in a way with education. Both are for the benefit of the people. In fact public health might be given first place for education without health is of little value. At the present time the state is spending nearly two dollars per capita for educational purposes and three cents per capita for public health. The communities are spending different rates for education but always in excess of that spent by the state at large. Few of the communities are spending as much per capita for public health as is the state. If the state were to contribute ten cents per capita to public health work and the communities throughout the state were to contribute a like amount, making a total of twenty cents per capita for the entire population of Minnesota, this would put public health on a substantial basis in this state.

Too much attention cannot be given to the control of preventable diseases. It is a well recognized fact that to control these diseases we should, so far as possible, reach the primary cases and separate them from the well in order to prevent further spread, or the creation of secondary cases. The primary cases can only be properly handled in isolation hospitals. The day for the establishment of isolation hospitals throughout the state should not be far distant if public health affairs are to be properly handled. While this may seem to be a great expense, it would be a great economy and this fact can easily be established by anyone who gives it a moment's consideration. Antiseptic surgery revolutionized hospitals, for it became a recognized fact that surgical cases were less liable to infection in the well equipped hospital than in the ordinary home. The patient for surgical work is removed to a hospital to prevent the infection of an individual. The knowledge that we now have of preventable diseases should revolutionize the old isolation hospitals. The primary cases of infectious diseases should be removed to these hospitals, not to prevent the infection of one individual but for the protection of many individuals.

*Copy of the report of this survey was sent to all members of the Legislature.

State Board of Health
Report of
Division of Vital Statistics

Gerda C. Pierson, Director

REPORT OF THE DIVISION OF VITAL STATISTICS, FOR
YEARS 1914 AND 1915.

Gerda C. Pierson, Director.

INTRODUCTION.

Vital Statistics have rightly been called the bookkeeping of public health. More and more the public is beginning to appreciate the importance of the records of births and deaths.

The birth of a child should be registered. Such a record in the possession of the parents answers many questions. It establishes legal proof of age, parentage and legitimacy. It admits the child to school. It gives the child working papers when the proper age is reached, and it is the means of preventing the child from being put to work before time. A birth record is all-sufficient to entitle a young man to the rights and privileges of citizenship. Many a man has been thwarted in his plans to enter one of the professions and to take a civil service examination, for the reason that he was unable to produce sufficient evidence as to the date of his birth.

The registration of deaths, with information upon certain points, is essential to the progress of medical and sanitary science in preventing and restricting disease, and in devising and applying remedial agencies. Statistics of illness and death are among the chief means of a community in preventing suffering and saving life. The health officer must know where cases of contagious disease are to be found, for this is the only way in which he can check epidemics and protect the people. Death certificates acquaint the modern health officer with the chief weaknesses of his sanitary arrangements. Too many cases of typhoid fever indicate a bad water supply, an inadequate sewerage system, polluted milk or unrecognized typhoid carriers. A large number of deaths from tuberculosis calls for a distinct health policy in a community.

While the Minnesota law relating to vital statistics makes the executive officer of the board the state registrar, it was deemed advisable by the State Board of Health to put this work under a division, with a director in charge. This was done at the regular meeting of the board in October, 1915.

Each city, village and township in Minnesota constitutes a separate and distinct registration district. In a city, the health officer is the registrar; in a village, the recorder; in a township, the town clerk. Under the law in force prior to 1911, the health officer was the local registrar of births and deaths in a village. This arrangement proved very unsatisfactory, for the reason that medical men coming into the small villages, and accepting the appointment of health officer, remained in many instances but a short time. Often they moved away from their district and without notifying this office, and as a result monthly returns failed to come in from such districts as required by law. When through one means or another we were finally advised that the health officer had resigned or moved away, it became necessary for us to notify the town clerk of the township in which the village was located that under the law he would have to look after the records for both villages and township, keeping them distinctly separate. It must be evident to any one that much confusion resulted from such conditions. For this reason, the law was revised in 1911, making the village recorder the registrar of births and deaths. These officials are often re-elected, so that in many instances a recorder is in office as registrar for a long period of time, and becomes thoroughly familiar with his work.

The state law relating to vital statistics was entirely changed in 1907, and was made to conform largely to the Model Bill, formulated by Dr. Cressy Wilbur, formerly Chief Statistician of the United States Census Bureau at Washington. This Model Bill has been approved by many statistical associations.

Many years ago the Census Bureau at Washington took steps to establish a "registration area" for deaths. This area was composed of a few states only. Minnesota tried for years to gain admission to this group of states, but failed. In 1908, the method of collecting and handling the records in this office was entirely reorganized, with the result that Minnesota was admitted into the death registration area on its 1910 returns. At the present time, the death registration area is composed of the following 24 states: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Maryland, Pennsylvania, Virginia, Ohio, Kentucky, Indiana, Michigan, Wisconsin, Minnesota, Missouri, Kansas, Colorado, Utah, Montana, Washington and California.

The Census Bureau requires transcripts each month of the records for these states. Such Bureau uses these transcripts in making up statistical data relative to deaths throughout the entire country.

States which are admitted into the "registration area" by the Census Bureau must have adequate laws and no state is admitted until it has the burial permit law. The burial permit law requires that a proper burial permit be issued before burial, and the only way to secure the burial permit is to file the death certificate. The primary intent of the burial permit law, therefore, is to insure the prompt filing of the death certificate, for the permit is, in fact, a receipt for the death certificate as well as authority for burial. A burial made without a permit is illegal, and there are three parties responsible for same, viz.: the sexton of the cemetery, the undertaker and the friends or relatives of deceased in charge.

Not until 1915 did the Census Bureau establish a birth registration area, and this at the time was only temporary, with a view of establishing a permanent area comprised of those states whose returns reached a certain standard. Ten states and the District of Columbia were selected for the test, which was made by ordering transcripts of the 1915 birth records to be sent to the United States Census Bureau at Washington. In the spring of 1916, we were notified that Minnesota had been admitted into the permanent "registration area" for births established in that year. The states comprising this registration group are the following: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, Pennsylvania, Michigan, Minnesota, and, as stated above, the District of Columbia. These names show that Michigan and Minnesota are the only states in the registration area west of New York and Pennsylvania.

Minnesota is therefore a registration state as regards both births and deaths, and we are required to furnish transcripts each month of all our records to the Census Bureau. Such bureau pays for the copying of these transcripts. This work is therefore no burden upon the routine work of the Board, for it is done by clerks employed especially for that purpose.

The following table shows the progress Minnesota has made in its work on vital statistics:

BIRTHS

Year	Births (Stillbirths Excluded)	Stillbirths	Totals
1908.....	42,894	1,296	44,190
1909.....	43,790	1,418	45,208
1910.....	44,092	1,373	45,465
1911.....	45,561	1,503	47,064
1912.....	48,440	1,541	49,981
1913.....	50,147	1,554	51,701
1914.....	51,945	1,661	53,606
1915.....	55,233	1,607	56,840

DEATHS

Year	Deaths		Stillbirths	Totals
	(Stillbirths	Excluded)		
1908.....	20,956		1,296	22,252
1909.....	20,662		1,418	22,080
1910.....	22,868		1,373	24,241
1911.....	21,893		1,503	23,396
1912.....	20,502		1,541	22,043
1913.....	22,799		1,554	24,353
1914.....	23,382		1,661	25,043
1915.....	22,743		1,607	24,350

Without vital statistics, the state is not in position to know how best to safeguard the health and prosperity of its citizens. Records of births and deaths correspond to the income and disbursements of a business man. A record properly kept by the state shows whether or not progress is being made. Making these records what they should be entails expense and much detailed work. Proper funds should be appropriated by the state. The saving in human life and energy will be more than sufficient to offset the cost of maintaining a proper supervision of this work.

**AN OUTLINE OF THE METHODS OF HANDLING THE RECORDS OF
BIRTHS AND DEATHS, ETC., IN THE VITAL STATISTICS
DIVISION OF THE STATE BOARD OF HEALTH
OF MINNESOTA.**

Each city, village and township in Minnesota constitutes a separate and distinct registration district, and each such district has its own local registrar. At the present time, there are in the state 2,575 registration districts. The State Board of Health has nothing to do with the appointing of the local registrars. They are dependent upon local election. The registrar in a city is the health officer; in a village, the recorder; in a township, the town clerk. The local registrar may appoint a deputy to serve for him in his absence or disability.

The local registrars are required by law to forward to this office on the 10th of each month all original returns of births and deaths for their districts for the previous month. For those months in which no birth or death occurred, they are required to send in a card reporting that fact. Such cards are furnished by this board, as are also the blanks, etc., used in making returns.

A set of books containing the name of every registration district in the state, together with the name of the local registrar, is kept and checked up each month. (A special column is provided in these books for any delayed returns that may be received for previous years.) Each report and card is entered to the credit of the month in which the birth or death occurred, regardless of the date of receipt at this office. A check is placed on each report and card to show that it has been so registered.

A glance at the books immediately reveals whether or not a district is up to date. At the end of each month, a notice is sent to any registrar whose records are in arrears. It will thus be seen that from these books it is possible to make up tables at any time during the year, showing the number of returns for any county or district in the state. The books are also used at the end of the year to make up a table for the entire state.

After the returns are registered in these books, they are separated as to births and deaths, and all incomplete and incorrect returns are held out. Form letters are sent to the local registrar or embalmer who is responsible for the incomplete or incorrect return, together with a copy of the certificate. The copy is made out on a blue blank, to distinguish it from the orig-

inal return which is made out on a white blank. The number of the form letter and the date on which it is sent is stamped on both the original and copy, which makes it an easy matter to locate the original when the copy is returned. Many of the incorrect returns necessitate the writing of special letters, in which case a copy of the letter is attached to the original certificate. The original report and copy are also stamped in such cases, but on another portion of the certificate, which immediately reveals that a special letter has been written.

It is but natural that many of the causes of death as originally given are incomplete for classification purposes. As a registration state, we are required to conform to the International Classification of Causes of Death, and this necessitates our following up all returns which do not contain definite data as to cause of death. Letters of inquiry bearing on this point are sent to the attending physician direct, for of course he is the only one in position to give the necessary additional information.

Two follow-up files are kept, each arranged in alphabetical order as to county. In one of these, all reports involving personal letters are kept; in the other, those where it is necessary to use only the form letter. At the end of each month, these files are gone over, and if necessary, a second letter is written concerning matters which have not been straightened out.

All returns of deaths (including stillbirths) for infants less than two years old, are checked to ascertain whether or not the birth report is also on file, if the death report shows the child as born in Minnesota. If both returns are in, a check is placed on each report (after the name of child) to show this fact. If the birth report is not in, a form letter is sent to the local registrar, asking if the birth occurred in his district. If so, he is requested to secure the report. If the registrar advises that the child was not born in his district, a letter and a blank birth certificate are sent to the parents, together with a stamped return envelope, asking in what district the child was born, and if the birth report was properly filed at the time. If no report has been made, the parent is requested to fill out the blank, and return it to this office. When received, a copy of it is forwarded to the local registrar, so that his records may agree with ours.

Physicians and midwives are required by law to report births within ten days to the registrar of the district where the birth occurred. If no medical attendant has been employed, the parent is required to report. If a birth or death report is sent direct to this office by the attending physician or embalmer, for the reason that he is unable to ascertain the name of the local registrar, a copy of the certificate is forwarded to such registrar, together with a letter requesting him to record, number and sign it, and return it to this office. The original report is then placed to his credit.

The original returns and the cards reporting no births or deaths for certain months are put into filing cases, after registering, in alphabetical order. They are retained in alphabetical order as to county during the entire year, and also as to registration district under county. This makes it an easy matter to look up any report for a given district.

In a large percentage of cases, the given names of children are not known at the time the regular report must be filed (i. e., within ten days) with the local registrar by the attending physician, mid-wife or parent, as the case may be. Supplemental blanks are furnished to obtain the child's given name. When the supplemental reaches this office, the names are inserted on the original returns.

The local registrar is entitled to the sum of 25 cents for each report sent in, and also for each card (reporting no births or deaths for certain months) received on time, viz.: on or before the 15th of the month following that to which the card applies, providing he does not later send in a delayed report for the month mentioned on the card. Under these conditions, he receives his fee for the delayed report, but the card is cancelled, as are also all cards not received on time.

The fees are paid by the county, not by the state. On or before March 1st of each year, this board is required by law to send copies of all returns received for the preceding year, to the clerks of court. With these copies

goes an abstract showing the number of returns sent in by each registrar and also the number of cards reporting no births or deaths, which have been received at this office on time. At the end of the year, the number of reports and cards entered to the credit of each registrar in the registration books is compared with the original returns and cards to ascertain whether or not the books and originals agree.

The State Board of Health has power to appoint sub-registrars, and has given this appointment to the licensed embalmers in this state. Under this appointment, the licensed embalmers have the right to accept death certificates and issue burial and removal permits in any registration district in the state where there is not an ordinance requiring that the permit be issued by the local registrar. The licensed embalmers when serving as sub-registrars, are required by law to send the original death certificate within five days to the local registrar of the district where the death occurred. The sub-registrars receive no fees.

Further, the licensed embalmers are required to make monthly reports to this office of all cases where they have handled remains, or simply sold coffins. The blanks for this purpose are furnished by the State Board of Health. These blanks give the name of deceased, date of death, place of death (by registration district), name of the local registrar to whom the embalmer sent the original death certificate and date sent, and state whether or not the licensed embalmer issued the burial permit or sold the coffin only. These monthly reports from embalmers are checked up to ascertain if the original death certificate has been received from the local registrar at place of death. If the return is not on file, a form letter is sent to the local registrar (health officer, village recorder or town clerk, as the case may be) advising him that we have knowledge of this death occurring in his district, and that the report was sent him by the sub-registrar (licensed embalmer) who handled the remains. If the local registrar replies that no such report has reached him, the embalmer is advised of this fact, and is instructed to trace the certificate at once. If the original cannot be located, a duplicate must be secured.

The various railroad companies submit to this office periodically all "Duplicate Transportation of Corpse Permits" for the remains of those shipped who have died in this state. These duplicate shipping permits are also checked to find if the original death report is on file. If not, the matter is immediately taken up with the local registrar at place of death and if not straightened out by him, is referred to the shipping undertaker.

This office receives daily requests for certified copies of both birth and death records, to be used for legal purposes. We are required by law to charge a fee of fifty cents for each such certified copy issued. All such fees are turned over to the State Treasurer at the end of each month.

The original returns of births and deaths are bound but once a year, each volume containing about 500 records. In binding, the returns are arranged in alphabetical order as to county, also as to registration district in county, and chronologically as to date of birth or death. For example: Aitkin village is the first registration district in Aitkin county. All reports for that district are arranged in order of month and date on which the birth or death occurred. Aitkin township follows as the next registration district. If there are a village and a township of the same name, the records for the village precede those for the township in the bound volume.

The reason for keeping the returns in alphabetical order as to county and district is this: In Minnesota we have a varied population, made up of Finns, Austrians, Italians, Swedes, Norwegians, Germans, French, etc. Some of these foreigners often travel under different names, and for that reason it is unwise to depend upon the index cards alone. When receiving requests for certified copies of these records, to be used for legal purposes, the applicant as a rule is able to advise us at least of the county in which the birth or death occurred. Under such conditions, even though there is a mixup as to name of deceased, it is a rare thing not to be able to locate the record.

The Division of Vital Statistics co-operates with the Division of Preventable Diseases by furnishing the latter with records of all deaths due to tuberculosis (all forms,) scarlet fever, diphtheria, typhoid fever, smallpox, anterior poliomyelitis and rabies. These records enable the Division of Preventable Diseases to check off on the records of the latter those cases which have terminated fatally. In some instances, the report of death is the first information the Division of Preventable Diseases has of the case.

The statistics for deaths from preventable diseases are worked up each month, and the bulletin covering same is published in the *Journal-Lancet*, the official organ of the Minnesota State Medical Society.

All cemetery officials, of whom we have knowledge, are instructed as to their duties concerning the appointing of sextons and the requirements of the law as regards burial permits and the keeping of cemetery records.

All local registrars in the state are encouraged and requested to report irregularities in the matter of unreported births and deaths, illegal burials, etc., to the State Board of Health promptly.

All this, it is evident to any one, results in a very extensive correspondence, probably an average of at least 35 personal letters each day, most of them of necessity long, for they involve much detail. The form letters sent out during the year, including those referring to incomplete and incorrect returns, and also those of general instructions to new registrars, reminders, etc., probably equal in number the personal letters.

At the beginning of each year, the final classification of deaths for the preceding year is begun. Punch cards are made from the original returns, and tables compiled from the cards.

Each and every report, card, letter, etc., bearing on the subject of vital statistics, is dated the day of receipt at this office. These dates, so far as the original records of births and deaths, cards reporting no births or deaths for given months, and embalmers' monthly reports, are concerned, immediately reveal whether or not there was any delay in forwarding them to this office.

The foregoing outline, though long, does not by any means indicate all the detail it is necessary to put upon these records before they are of value either for legal or statistical purposes. Further, we receive frequent requests for certain recent statistics such as the number of deaths due to a given disease in the state, or in certain counties or localities. This, of course, means extra work.

December 1st, 1916.

Birth Reports.

Total births by counties for 1914 and 1915, Tables I and XXIV.

Mortality Records.

The deaths for the calendar years 1914 and 1915 for preventable causes are as follows:

Total deaths from all causes classified by counties for 1914 and 1915, Tables II and XXV.

Tuberculosis:

- a. Pulmonary, Tables III and XXVI.
- b. Non-pulmonary, Tables IV and XXVII.

Pneumonia:

- a. Broncho, Tables V and XXVIII.
- b. Lobar, Tables VI and XXIX.

Bronchitis:

- a. Acute, Tables VII and XXX.
- b. Chronic, Tables VIII and XXXI.

Cancer, Tables IX and XXXII.

Diarrheal diseases of children:

a. Under two years, Tables X and XXXIII.

b. Two to five years, Tables XII and XXXIV.

Typhoid fever, Tables XII and XXXV.

Diphtheria, Tables XIII and XXXVI.

Scarlet fever, Tables XIV and XXXVII.

Whooping cough, XV and XXXVIII.

Measles, Tables XVI and XXXIX.

Rabies, Tables XVIII and XLI.

Smallpox, Tables XVII and XL.

Epidemic anterior poliomyelitis, Tables XIX and XLIII.

Epidemic cerebro-spinal meningitis, Tables XX and XLIV.

Puerperal sepsis, Tables XXI and XLV.

Tetanus, Tables XXII and XLII.

Accidents, Tables XXIII and XLVI.

TABLE I—TOTAL BIRTHS REPORTED FOR 1914.

	Births exclusive of Still- births	Still- births	Children born Illegiti- mate		Births exclusive of Still- births	Still- births	Children born Illegiti- mate
Aitkin	319	11	1	Meeker	377	7	.....
Anoka	264	12	4	Mille Laes	247	14	1
Becker	561	23	12	Morrison	625	14	5
Beltrami	695	25	12	Mower	560	13	7
Benton	310	9	2	Murray	336	7	2
Big Stone	217	7	4	Nicollet	314	8	4
Blue Earth	671	16	12	Nobles	429	13	3
Brown	540	11	8	Norman	299	15	.....
Carlton	526	18	6	Olmsted	481	14	8
Carver	381	9	2	Otter Tail	1,133	36	8
Cass	314	17	6	Pennington	322	4	4
Chippewa	350	17	5	Pine	444	10	5
Chisago	263	13	2	Pipestone	263	6	.....
Clay	439	10	7	Polk	773	19	10
Clearwater	164	4	1	Pope	326	7	2
Cook	19	0	0	Ramsey	153	3	.....
Cottonwood	404	9	2	St. Paul	5,017	173	245
Crow Wing	622	29	11	Red Lake	187	9	2
Dakota	590	22	7	Redwood	485	11	5
Dodge	224	8	2	Renville	532	14	4
Douglas	377	10	3	Rice	501	18	6
Faribault	403	12	3	Rock	250	12	1
Fillmore	508	8	7	Roseau	403	14	3
Freeborn	475	7	2	St. Louis	3,025	128	26
Goodhue	546	7	7	Duluth	2,162	71	82
Grant	192	2	3	Scott	273	6	6
Hennepin	648	15	5	Sherburne	177	4	2
Minneapolis	7,880	313	389	Sibley	358	4	3
Houston	287	10	5	Stearns	1,358	35	7
Hubbard	242	18	0	Steele	353	7	4
Isanti	298	5	6	Stevens	268	1	1
Itasea	531	21	7	Swift	352	16	2
Jackson	367	10	5	Todd	601	19	5
Kanabec	191	6	3	Traverse	206	7	2
Kandiyohi	436	9	4	Wabasha	353	11	5
Kittson	232	8	3	Wadena	240	8	1
Koochiebing	254	6	4	Waseca	259	11	.....
Lac qui Parle	402	8	4	Washington	386	18	2
Lake	203	3	1	Watsonwan	292	7	3
Le Sueur	371	11	3	Wilkin	251	6	3
Lincoln	282	8	3	Winona	729	16	16
Lyon	279	17	3	Wright	609	19	1
McLeod	442	11	4	Yellow Medicine	373	9	2
Mahnomen	108	4	2				
Marshall	474	11	6				
Martin	467	7	3				
				Total	51,945	1,661	1,089

TABLE II—DEATHS FROM ALL CAUSES BY COUNTIES IN 1914

COUNTY	Pulmonary Tuberculosis	Non-Pulmonary Tuberculosis	Lobar Pneumonia	Broncho Pneumonia	Acute Bronchitis	Chronic Bronchitis	Influenza	Cancer	Diphtheria	Whooping Cough	Scarlet Fever	Measles	Typhoid Fever	Diphtherial Diseases Under Two Years	Diphtherial Diseases Two to Five Years	Poliomyelitis	Epidemic Meningitis	Tetanus	Purpural Sepsis	Small Pox	Rabies	Accidents	All other Causes	Total Deaths (Stillbirths excluded)	Stillbirths
Atkin.....	6	4	4	4	2	1	1	7	8	3	6	1	3	1	3	1	1	1	1	1	1	1	39	85	11
Anoka.....	14	8	4	4	1	1	1	9	3	15	10	2	1	13	3	1	1	1	1	1	1	16	108	12	
Becker.....	28	29	14	14	2	5	1	9	10	10	10	1	1	5	3	1	1	1	1	1	1	33	101	23	
Beltrami.....	37	29	4	4	1	1	1	7	1	1	1	1	1	6	3	1	1	1	1	1	1	45	128	25	
Benton.....	6	1	4	4	1	1	1	7	1	1	1	1	1	3	2	1	1	1	1	1	1	9	52	9	
Big Stone.....	6	1	4	4	1	1	1	7	1	1	1	1	1	3	2	1	1	1	1	1	1	9	55	7	
Blue Earth.....	15	7	17	8	1	3	8	28	3	1	1	5	1	4	2	1	1	1	1	1	1	28	228	16	
Brown.....	12	4	12	4	1	1	1	21	2	1	1	1	1	13	1	1	1	1	1	1	1	18	80	18	
Carlton.....	20	1	8	11	2	1	1	9	3	1	2	1	1	13	1	1	1	1	1	1	1	11	105	9	
Carver.....	11	1	11	4	1	1	1	9	7	1	2	1	1	6	1	1	1	1	1	1	1	16	60	156	
Cass.....	22	19	4	19	4	1	1	13	1	1	1	1	1	1	1	1	1	1	1	1	1	11	105	9	
Chippewa.....	9	4	19	6	1	1	1	14	3	1	1	1	1	3	3	1	1	1	1	1	1	11	79	143	
Chisago.....	7	1	12	7	1	1	1	14	3	1	1	1	1	4	3	1	1	1	1	1	1	11	71	134	
Clay.....	17	6	8	7	1	1	1	11	6	9	1	2	4	11	1	1	1	1	1	1	1	23	101	210	
Clearwater.....	6	3	2	2	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	8	26	51	
Cook.....	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	5	3
Cottonwood.....	6	11	9	9	1	1	1	7	1	1	3	1	6	10	1	1	1	1	1	1	1	11	60	126	
Crow Wing.....	11	16	13	1	1	5	1	17	1	5	1	1	7	17	1	1	1	1	1	1	1	33	118	221	
Dakota.....	25	2	20	10	1	1	1	16	3	1	10	1	2	17	1	1	1	1	1	1	1	25	164	310	
Dodge.....	3	7	6	7	1	1	1	16	1	1	1	2	2	2	2	1	1	1	1	1	1	6	62	110	
Douglas.....	14	4	10	9	2	2	1	24	1	1	1	2	2	8	2	1	1	1	1	1	1	14	108	203	
Faribault.....	8	14	4	1	1	1	1	8	2	2	1	2	2	2	2	1	1	1	1	1	1	6	112	107	
Fillmore.....	13	10	8	2	2	2	1	25	1	1	1	2	2	2	2	1	1	1	1	1	1	20	161	255	
Freeborn.....	16	7	9	7	1	1	1	27	5	3	5	1	3	4	1	1	1	1	1	1	1	10	131	232	
Goodhue.....	35	5	23	10	1	2	5	31	1	4	1	1	3	7	1	1	1	2	1	1	1	19	213	363	
Grant.....	3	2	2	2	2	1	5	9	1	1	1	1	1	1	1	1	1	1	1	1	1	6	47	76	
Grant.....	396	86	272	190	15	16	20	334	158	51	89	11	43	153	22	1	5	2	26	2	387	2,113	4,402	328	
Hennepin.....	19	8	8	6	2	3	1	13	1	1	1	2	1	4	4	1	1	1	1	1	1	3	86	146	
Houston.....	3	2	2	2	1	1	1	13	1	1	1	1	1	4	1	1	1	1	1	1	1	46	79	18	
Isanti.....	8	6	4	4	1	1	1	13	1	3	4	1	1	10	1	1	1	1	1	1	1	73	138	15	
Itasca.....	4	2	19	8	3	1	1	19	1	2	1	1	1	10	2	1	1	1	3	1	1	36	74	179	
Jackson.....	8	5	6	1	1	1	1	11	3	1	5	1	1	3	1	1	1	1	1	1	1	7	80	131	
Kanabec.....	5	9	1	1	1	1	2	3	1	2	1	1	1	2	1	1	1	1	1	1	1	5	34	58	
Kandiyohi.....	20	4	6	3	3	1	1	14	3	2	1	1	2	3	1	1	1	1	1	1	1	9	126	196	
Kittson.....	5	8	6	3	1	1	1	8	1	1	1	1	1	4	1	1	1	1	1	1	1	30	59	78	
Koochiching.....	5	1	14	1	1	1	1	5	1	3	3	1	4	11	4	1	1	1	1	1	1	30	59	143	
Lac qui Parle.....	10	2	7	5	1	1	1	9	2	1	1	1	1	6	1	1	1	1	1	1	1	11	75	128	
Lake.....	4	1	1	1	1	1	1	4	1	1	6	1	1	3	1	1	1	1	1	1	1	16	34	73	

TABLE III—DEATHS FROM PULMONARY TUBERCULOSIS IN 1914

COUNTY	Sex		Age													Conjugal Cond.				
	Total	Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given	
Aitkin	6	3	3					2	2	2						2	4			
Anoka	14	4	10				1	3	3	3						4	9	1		
Becker	28	16	12	1			1	7	8	3	3	3				13	13	2		
Beltrami	37	27	10	1	1		3	4	9	4	6	4	3			16	16	5		
Bemidji	6	4	2	1				1	3	1						4	2			
Benton	3	3					1		1	1						2	2			
Big Stone	6	1	5				1	2		2					1	2		2		
Blue Earth	15	9	6					5	3	3	1	1			2	8	6	1		
Mankato	9	6	3					4	2	2					1	5	3	1		
Brown	12	9	3	1				1	2	1	4	1	2			5	6	1		
New Ulm	7	6	1	1				2	2	1	1	1	1			4	3	1		
Carlton	20	11	9		3	1		5	7	2	1	1				11	9			
Cloquet	5	3	2					1	1	1	1	1				3	2			
Carver	11	5	6					1	5	3				2		4	5	2		
Cass	22	11	11				1	6	6	5	2	2				18	4			
Chippewa	9	4	5					1	2	6						1	8			
Chisago	7	4	3					1	2	1	1	1			1	2	4	1		
Clay	17	11	6					7	4	4	2					6	11			
Clearwater	6	2	4				1	1	3	1						3	3			
Cook	1	1						1	1	1						1	1			
Cottonwood	6	3	3				1		2	1	2					3	3			
Crow Wing	11	5	6					1	4	2	1				1	2	9			
Brainerd	7	2	5					3	1	1	2					2	5			
Dakota	25	20	5					6	11	2	3	2	1			11	13	1		
Dodge	3	2	1				1		1	1						1	2			
Douglas	14	6	8	1	1			2	4	5	1					5	9			
Faribault	8	3	5					3	1	3		1				2	6			
Fillmore	13	8	5					6	4	1	2					5	8			
Freeborn	16	7	9					1	4	5	1	1	4			7	9			
Albert Lea	7	3	4					2	1	1	1	2				3	4			
Goodhue	35	17	18	2				1	10	12	3	3	2	2		14	20	1		
Red Wing	11	7	4	1				1	5	3			1			7	4			
Grant	3	2	1					1	1							2	1			
Hennepin	396	231	165	2			2	28	138	110	62	39	12	2	1	200	159	31		
Minneapolis	384	223	161	2			2	28	134	109	58	37	11	2	1	198	150	30		
Houston	14	9	5					1	3	4	1	4	1			4	8	2		
Hubbard	3	1	2					2	1							2	1			
Isanti	8	6	2					5		2	1					5	2	1		
Itasca	8	5	3	1			1	2	1	1	2					5	3			
Jackson	4	2	2				1		3							4	1			
Kanabec	5	3	2					1	3	1						4	1			
Kandiyohi	20	10	10				1	3	10	2	1	3				11	8	1		
Kittson	5	1	4					1	2	1			1			1	4			
Koochiching	5	4	1						1	3	1					3	2			
Lac qui Parle	10	5	5					4	3		3					3	7			
Lake	4	3	1					2	1	1		1				1	2	1		
Le Sueur	5	4	1					2	1	1		1				3	2			
Lincoln	4	2	2					3	1							2	2			
Lyon	6	5	1					2	2	1	1					3	3			
McLeod	10	5	5					1	2	1	3	1	1	1		5	4	1		
Mahnomen	17	9	8	1		1	2	1	2	1	3	4	1	1		5	11	1		
Marshall	14	9	5					3	4	1	3	3				8	6			
Martin	6	3	3					1	2	2	1					1	4	1		
Meeker	18	7	11					1	10	6	1	1				9	9			
Mille Lacs	5	3	2					1	2	1		1				1	4			
Morrison	13	7	6	2				1	2	3	1					5	7	1		
Little Falls	5	3	2	1				1	1	1		1				2	2	1		
Mower	10	4	6					2	1	4	1					6	3	1		
Austin	2	2						1	1			1				1	1			
Murray	6	2	4					1	3	2						2	4			
Nicollet	29	11	18					1	3	11	9	4	1			15	11	3		
Nobles	1		1					1	1							1				
Norman	8	5	3					2	1	2	1	1	1			4	4			
Olmsted	19	7	12					2	4	7	3	1	2			7	12			
Rochester	16	7	9					2	3	7	2	1	1			7	9			
Otter Tail	79	39	40	1		1		7	22	15	11	11	9	2		40	32	7		
Fergus Falls	39	21	18					1	11	5	9	6	7			21	16	2		
Pennington	12	5	7					2	4	3	2	1				5	7			
Pine	14	9	5					3	9	4	5	1	2			12	11			
Polk	39	18	21			1		5	9	11	5	2	4	2		19	18	2		
Crookston	12	6	6			1			2	4	2	1	2			7	5			

TABLE III—DEATHS FROM PULMONARY TUBERCULOSIS IN 1914—Continued

COUNTY	Sex		Age													Conjugal Cond.			
	Total	Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given
Pope	9	7	2					1	3	2	1	1	1			6	3		
Ramsay	274	167	107					27	89	63	40	32	16	4		139	108	26	1
St. Paul	262	158	104		1		2	25	85	60	39	31	15	4		132	103	26	1
Red Lake	3	2	1					1	1	1	1					1	2		
Redwood	7	4	3					1	2	3	1					1	6		
Renville	21	10	11					4	5	7	2		3			10	9	2	
Rice	24	11	13		1			6	9	3	1	1	1	2		18	5	1	
Faribault	17	10	7		1			6	5	3	1		1			15	2		
Rock	5	2	3					1	2			2				2	3		
Roseau	13	8	5					2	7	2	1					7	4	2	
St. Louis	202	132	70	6	1	3	2	23	61	45	29	18	9	4	1	105	83	9	2
Duluth	119	90	29	2		1	1	7	42	22	21	15	4	3	1	70	42	5	2
Eveleth	4	1	3					1	2	1						2	2		
Virginia	8	4	4					2	1	5						2	5	1	
Chisholm	9	5	4			1		2	1	3						4	5		
Scott	16	6	10					1	4	2	3	5		1		11	3	2	
Sherburne	5	3	2						1	1	1	2				1	3	1	
Sibley	5	2	3						3	1				1		3	12		
Stearns	31	22	9					3	10	7	3	1				13	17	1	
St. Cloud	10	8	2						4	3	1	2				5	5		
Steele	12	8	4					1	1	4	1	2				8	3	1	
Owatonna	8	7	1				1	1	1	1	1			2		5	2	1	
Stevens	5	3	2						2	2				1		1	3	1	
Swift	6	4	2				1	1	2	1			1			2	4		
Todd	6	2	4						3	3						2	4		
Traverse	2	2							1	1	1					1	1		
Wabasha	10	5	5						2	3	1	3	1			4	5	1	
Wadena	7	1	6						3	2		1	1			2	4	1	
Waseca	9	2	7						2	2	4	1	1			4	5		
Washington	28	20	8	1				14	9	1	2	1				16	12		
Stillwater	15	11	4	1				10	3	1						10	5		
Watsonwan	6	3	3						3	2	1					2	3	1	
Wilkin	3	3							1	1		1				2	1		
Winona	45	31	14					4	14	9	5	9	3	1		24	18	3	
Winona	37	26	11					3	14	8	4	6	2			20	16	1	
Wright	21	8	13					3	10	4	1	3				10	9	2	
Yellow Medicine	19	5	14					3	4	7	2		1	1	1	7	10	2	
Totals	1948	1105	843	20	8	7	21	179	609	469	282	201	103	41	8	948	865	126	9

Totals by Months: January, 161; February, 149; March, 216; April, 222; May, 184, June, 155; July 188; August, 148; September, 119; October, 121; November, 156; December, 129.

Deaths by occupations: Farmer, 255; laborer, 171; domestic, 53; carpenter, 40; merchant, 20; clerk, 97; railway employee, 24; miner, 7; teamster, 34; woodsmen, 25; professional, 13; mechanic, 50; mason, 27; teacher, 29; agent, 9; bookkeeper, 25; hotel, 6; official, 5; painter, 25; printer, 13; dressmaker, 9; miller, 4; contractor, 46; policeman, 3; tel. and tel. operator, 7; commercial traveler, 2; miscellaneous, 89; no occupation, 860.

Birthplace of Decedents: Minnesota, 932; Other United States, 400, Foreign, 600; Not Given, 16.

TABLE IV—DEATHS FROM NON-PULMONARY TUBERCULOSIS IN 1914

COUNTY	Sex		Age											Conjugal Cond.					
	Total	Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given
Aitkin.....	33		33		1			2								3			
Anoka.....	33	1	32						1			1				1	2		
Becker.....	4	2	2	2		1	1									4			
Beltrami.....	2	1	1		1						1					2			
Bemidji.....	2	1	1		1						1					2			
Big Stone.....	1	1							1							1			
Blue Earth.....	5	4	1		1	1			1			2			3	2			
Mankato.....	3	3			1										3	2			
Brown.....	7	3	4			1			1	3	1			1	2	5			
New Ulm.....	2	1	1						1	1					2				
Carlton.....	1	1						1							1				
Carver.....	2	2		1										1				1	
Chippewa.....	4	1	3		1			1	1	1					4				
Chisago.....	1														1			1	
Clay.....	6	3	3	1			3		1	1					5	1			
Clearwater.....	3	2	1						1	1					1	2			
Dakota.....	2	2		1								1			1	1			
Douglas.....	4	3	1						1	1			2		2		1		
Fillmore.....	2	2				1			1	1					2				
Freeborn.....	7	4	3	1	2		2	1	1	1					7				
Albert Lea.....	3	2	1		1				1						3				
Goodhue.....	5	2	3	1				2		1	1				3				
Grant.....	3	1	2						1	2					1	2			
Hennepin.....	86	46	40	5	4	10	7	7	14	15	8	8	5	2	1	54	29	3	
Minneapolis.....	86	46	40	5	4	10	7	7	14	15	8	8	5	2	1	54	29	3	
Houston.....	3	1	2					2	1						2	1			
Hubbard.....	2	1	1								1			1		1	1		
Itasca.....	2	2			1					1					1	1			
Kandiyohi.....	4	2	2	1					2	1					2	2			
Kittson.....	3	1	2					1		1					2	1			
Koochiching.....	1	1													1				
Lac qui Parle.....	2	2		1							1				1		1		
Le Sueur.....	2	2						2							2				
Lincoln.....	1		1												1				
Lyon.....	6	2	4						2	2	2					5			
McLeod.....	3	3		1										2	1	2			
Mahnomen.....	2	1	1	1				1							2				
Martin.....	1	1				1									1				
Meeker.....	5	1	4		1	1		2	1						5				
Mille Lacs.....	2	2				1					1				1	1			
Morrison.....	7	5	2	3		1		1	1	1					6	1			
Little Falls.....	2	2			1		1								2				
Mower.....	2		2						1		1					2			
Murray.....	1						1								1				
Nicollet.....	4	2	2						1	2		1			3	1			
Norman.....	3	1	2	1			1	1							3				
Olmsted.....	13	8	5				1	1	1	3	4	2	1	1	1	8	4	1	
Rochester.....	13	8	5				1	1	1	3	4	2	1	1	1	8	4	1	
Otter Tail.....	19	10	9	1		2	4		2	1	1	4	3		1	8	10	1	
Fergus Falls.....	9	6	3		1	1			2			3	2		3	6			
Pennington.....	3	2	1					1	1		1				2	1			
Pine.....	6	3	3	1	1					3					4	2			
Polk.....	11	8	3	1				5	3	2					2	9			
Crookston.....	1		1						1						1				
Pope.....	1								1						1				
Ramsey.....	65	39	26	6	6	12	5	10	14	3	3	5		1	51	11	1		2
St. Paul.....	64	38	26	6	6	12	5	10	14	3	3	4		1	50	11	1		2
Red Lake.....	1		1						1						1				
Redwood.....	3	2	1					1		2					2	1			
Renville.....	8	3	5		1	1	1	4				1			7	1			
Rice.....	9	3	6			1	2	4	2						9				
Faribault.....	8	2	6				2	3	2						8				
St. Louis.....	41	22	19	10	3	5	3	4	5	6	4	1			28	12	1		
Duluth.....	20	10	10	3	2	1	1	3	3	4	3	1			9	10	1		
Hibbing.....	4	2	2	1		1	1								4				
Virginia.....	3	3				1			1						3				
Chisholm.....	3	2	1	2					1						2	1			
Sherburn.....	1		1	1											1				
Stearns.....	19	4	8		2		1	4	1	2	2				9	3			
St. Cloud.....	9	5	4		1				1		1				3	2			
Steele.....	3	1	2			1			1			1			2	1			

TABLE IV—DEATHS FROM NON-PULMONARY TUBERCULOSIS IN 1914—Continued

COUNTY	Total	Sex		Age												Conjugal Cond.						
		Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given			
Owatonna.....	2	1	1						1									1	1			
Stevens.....	1	1																	1			
Swift.....	3	1	2					1	1	1	1							2	1			
Todd.....	1	1				1												1				
Traverse.....	1		1							1									1			
Wabasha.....	4	3	1	1						1			1	1				1	3			
Wadena.....	1	1					1											1				
Waseca.....	4	3	1	2							1				1			2	2			
Washington.....	4	3	1	1					2							1		3	1			
Wilkin.....	2	2								1			1					1	1			
Winona.....	6	1	5					1	2	2	1							2	4			
Winona.....	3		3					1	1	1									3			
Wright.....	6	3	3		1	2			1				1	1				3	2	1		
Yellow Medicine.....	4	1	3					1	1				2					3		1		
Totals.....	440	230	210	44	26	43	33	63	72	61	35	35	15	8	5	285	140	13		2		

Totals by Months: January, 38; February, 49; March, 45; April, 37; May, 43; June, 43; July, 34; August, 36; September, 31; October, 29; November, 22; December, 33.

Deaths by Occupations: Farmer, 43; laborer, 19; domestic, 10; carpenter, 7; merchant, 5; clerk, 8; railway employee, 3; miner, 2; teamster, 5; woodsman, 1; professional, 3; mechanic, 8; teacher, 2; Barkeeper, 4; agent, 4; official, 2; painter, 1; printer, 4; dressmaker, 1; miller, 2; contractor, 5; miscellaneous, 13; no occupation, 288.

Birthplace of Deceaseds: Minnesota, 254; Other United States, 82; Foreign, 98; Not Given, 6.

TABLE V—DEATHS FROM BRONCHO PNEUMONIA IN 1914

COUNTY	Sex		Age											Conjugal Cond.					
	Total	Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given
Aitkin	8	5	3	3	2	2									1	7		1	
Anoka	4	1	3	1											1	1	2		
Becker	7	3	4	3	2				1					1		6		2	
Beltrami	14	13	1	4	2	1			1	1					13				
Bemidji	7	7				1			1		4					6			1
Benton	5	2	3	3				1							1	4		1	
Big Stone	4	2	2	3											1	1		1	
Blue Earth	8	3	5	3		1								1	3	4		2	
Mankato	3	3	1	1											2	1		2	
Brown	4	1	3	1											1	1		1	
New Ulm	1	1	1	1										2				1	
Carlton	5	3	2	4	1										5				
Cloquet	3	1	2	2											3				
Carver	11	6	5	3	1									4	5	1	4	6	
Cass	4	4		3											3				
Chippewa	6	4	2	2		1								1	2	3		3	
Chisago	7	3	4	3										1	1	3		2	
Clay	7	1	6	4										2	1	3		3	
Clearwater	2	2		2											2				
Cottonwood	9	2	7	3		2	1							1	1	6		2	1
Crow Wing	13	8	5	8									1		4	8		3	
Brainerd	6	4	2	3											2	3		2	
Dakota	10	6	4	2	4			1						2	1	7		2	1
Dodge	6	2	4	3	1	1									1	5		1	
Douglas	9	3	6	5											3	6		1	2
Faribault	4	2	2	3											1	3		1	
Fillmore	8	6	2	2	1										1	4		4	3
Freeborn	7	6	1	4	1										1	5		2	
Albert Lea	1	1	1	1											1				
Goodhue	10	4	6	3	2								1	3	1	5		1	4
Red Wing	4	2	2	1										2	1	1		3	
Grant	2	1	1	1											1	1		1	
Hennepin	199	109	90	100	22	12	3	2	1	2	6	10	4	23	14	144	20	32	1
Minneapolis	192	105	87	97	22	12	3	2	1	2	5	10	4	21	13	140	20	31	1
Houston	6	3	3	1				1							2	2		2	
Hubbard	2	1	1	1											1	1		1	
Isanti	7	2	5			1				1			1	2	1	1		2	4
Itasca	8	4	4	5	2	1									8				
Jackson	6	2	4	3	1	1	1								6				
Kanabec	1	1	1	1											1				
Kandiyohi	2	2	1	1											2				
Kittson	3	2	1	3											3				
Koochiching	1	1							1							1			
Lac qui Parle	5	2	3	3		2									5				
Lake	1	1			1										1				
Le Sueur	10	5	5	1				1						1	4	3	5	2	
Lyon	4	2	2	1		2									1	3		1	
McLeod	8	4	4	1	1	2									2	5		1	2
Mahonien	1	1	1	1											1				
Marshall	5	3	2	2	2										4			1	
Martin	2	2		2											2				
Meeker	7	2	5	1								1	1	1	3	1	3	3	
Mille Lacs	1	1	1	1											1				
Morrison	9	4	5	4	2									2	1	6		1	2
Little Falls	2	1	1	1											1	1		1	
Mower	10	6	4	3	1	2		1						1	2	8		1	1
Austin	6	4	2	3	1			1							5	5		1	
Murray	5	3	2	2		1					1	1			3	3		2	
Nicollet	6	3	3	1									1	3	1	3		1	2
Nobles	3	3		1	1										2			1	
Norman	4	4		2		1						1			4				
Olmsted	8	5	3	1	1				1				2	1	2	3		1	4
Rochester	3	2	1	1					1						1	1		1	2
Otter Tail	16	13	3	7	3					1	1	3		1	12	4			
Fergus Falls	2	2								1					1				
Pennington	7	5	2	3							1			2	1	3		2	
Pine	5	2	3	2		1					1				1	4		1	
Polk	6	3	3	3	2	1									6				
Crookston	1	1		1											1				
Pope	4	2	2	1									1	1	1	1		1	2
Ramsey	102	57	45	52	10	4	1			2	4	3	6	10	10	70	18	13	1

TABLE V—DEATHS FROM BRONCHO PNEUMONIA IN 1914—Continued

COUNTY	Total	Sex		Age												Conjugal Cond.			
		Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given
St. Paul	100	56	44	51	10	4	1		2	4	3	6	9	10	69	18	12	1	
Red Lake	1	1							1						1				
Redwood	6	1	5	3		1			1	1					6				
Renville	6	5	1	1			2		1			2			3	3			
Rice	9	3	6	2	1	1	1		1			1	2		5	4			
Faribault	3	1	2	1			1						1		2	1			
Rock	2	1	1	1								1							
Roseau	4	2	2	3								1			3			1	
St. Louis	100	56	44	53	18	10	1	1	2		3	1	3	5	86	6	8		
Duluth	48	25	23	22	9	4	1		2		2	1	2	2	38	4	6		
Eveleth	3	2	1	1										1	2			1	
Hibbing	5	4	1	3				1							5				
Virginia	8	6	2	3	2	1					1			1	7		1		
Chisholm	16	11	5	15	1										16				
Scott	3	1	2	2								1			2	1			
Sherburn	1	1										1						1	
Sibley	5	2	3	1	1								1	2	3			2	
Stearns	17	10	7	9	2	1		1					2	1	14	3			
St. Cloud	10	8	2	6	2	1						1			9	1			
Steele	3	2	1	2		1									3				
Owatonna	1	1		1											1				
Stevens	2		2	1									1	1	1			1	
Swift	2	1	1	1									1	1	1			1	
Todd	6	2	4	3						1	1		1		3	2		1	
Traverse	2	1	1	1						1					1	1			
Wabasha	5	2	3	1									2	2	1	1	3		
Wadena	1	1		1											1				
Waseca	4	3	1		1							1	2	1	1		2		
Washington	7	4	3	4							1	1		1	4	1		1	
Stillwater	3	1	2	2										1	2			1	
Watonwan	7	3	4	2	1		1					1	1		4	3			
Winona	12	6	6	2		1						1	3	5	5			7	
Winona	7	3	4	1								1	2	2	4			3	
Wright	12	10	2	3	2	1			1			1	3	1	7	3		2	
Yellow Medicine	6	4	2	4	2										6				
Totals	861	467	394	380	96	57	11	9	8	14	22	29	40	92	103	592	130	136	3

Total by Months: January, 125; February, 115; March, 112; April, 115; May, 67; June, 47; July, 28; August, 19; September, 34; October, 38; November, 57; December, 104;

Deaths by Occupations: Farmer, 78; laborer, 15; domestic, 1; carpenter, 2; merchant, 8; clerk, 6; railway employee, 2; miner, 1; teamster, 8; woodsman, 3; professional, 1; mechanic, 2; mason, 1; teacher, 3; barkeeper, 3; hotel keeper, 1; painter, 1; miller, 1; contractor, 2; miscellaneous, 14; no occupation, 707.

Birthplace of Decedents: Minnesota, 529; Other United States, 109; Foreign, 218; Not Given, 5.

TABLE VI—DEATHS FROM LOBAR PNEUMONIA IN 1914

COUNTY	Sex		Age													Conjugal Cond.				
	Total	Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given	
Aitkin	4	4							1		1	2				2	1		1	
Anoka	8	4	4	1						1	1	1	3			2	2	4		
Becker	22	16	6	4		1	1	1	2	4	4	5	5			12	8	2		
Beltrami	29	17	12	2		2		1	3	4	4	2	2		1	12	12	4	1	
Bemidji	13	12				1			1	1	5	2	2			7	2	3	1	
Benton	4	3	1	1	1			1				1	1			3	1			
Big Stone	4	2	2					1			1	2				1	1	1	1	
Blue Earth	17	7	10	1					1	1	1	3	3	4	6	6	6	8	1	
Mankato	8	3	5	1						1	1	1	1	2	2	2	2	3	1	
Brown	12	8	4							2	2	2	4	4	4	6	6	2		
New Ulm	2	2												1		1	1	1		
Carlton	8	5	3	1	1			1	1	1	1			1	1	5	2	1		
Cloquet	4	3	1					1	1	1	1				3	1				
Carver	1	1												1		1				
Cass	19	14	5	3	1	1		1	3	2	2	2	3	1	12	5	2			
Chippewa	9	6	3	1	1	1	1		1	2		2	2	1	5	4				
Chisago	12	9	3	1	1	1		2		1	2	1	1	3	4	4	4			
Clay	8	6	2	1	1	1	1		1			2	1	1	6	1			1	
Cottonwood	11	3	8		2									3	2	6	3			
Crow Wing	16	12	4	1				1	3	2	2	3	2	2	7	7	1	1		
Brainerd	13	10	3	1				1	3	2	1	2	2	2	7	4	1	1		
Dakota	20	12	8	2	2			3	3	2	1	1	1	2	4	10	5	5		
Dodge	7	6	1	1	1			1	1	2		1	1	1	3	1	3			
Douglas	10	4	6	1	1			1	2		1	1	1	4	2	8				
Faribault	14	7	7	1	1	2	1		1		1	1	1	3	6	4	4			
Fillmore	10	3	7	2			1					2	1	4	3	5	2			
Freeborn	9	7	2		2	1			2				2	2	5	1				
Albert Lea	5	3	2		1				2				2	2	3		3			
Goodhue	23	13	10	1		1		1	1	4		3	6	6	10	7				
Red Wing	11	3	8					1	1	1		2	3	3	2	4	5			
Grant	2	2												1		1				
Hennepin	272	172	100	22	12	5	4	7	25	24	36	46	38	34	19	105	109	54	4	
Minneapolis	257	161	96	22	12	5	4	5	25	23	35	41	35	32	18	101	100	52	4	
Houston	8	5	3	1				1			1	2	2	1	2	3	3			
Hubbard	8	3	5	1					1	1	2		2	1	1	5	2			
Isanti	6	5	1	2				1	2		1	1			4	2				
Itasca	15	11	4	2			1		1	4	2	3	1		8	5	2			
Jackson	5	5							1	1	2		1	1		4	1			
Kanabe	9	5	4	1				2		1	1		3	1	3	3	3			
Kandiyohi	6	2	4	1		1		2	1		1	1		2	5	1				
Kittson	6	4	2	1							1	1		2	2	2				
Koochiching	14	14						2	5	4	1	2		7	7	4			3	
Lac qui Parle	7	3	4	1						2		1	1	2	2	3	2			
Lake	3	2	1	2						1				2	2	1				
Le Sueur	10	8	2	1						1		1	2	5	2	5	3			
Lincoln	2	1	1			1				1				1		1		1		
Lyon	1													1		1				
McLeod	6	5	1	1		1						2	2	2	2	4				
Mahnomen	7	4	3		1	1		2					2	2	3	3	1			
Marshall	8	2	6	1	1	1			1	1	1		1	2	4	2	2			
Martin	10	5	5	1	1	1			1		3	1	1	1	4	4	2			
Meeker	16	10	6	3				1	1	1	1	3	3	2	6	7	3			
Mille Lacs	12	10	2	1	1			1	3	1	1	2	1	1	10	1	1			
Morrison	8	8				1	1		1				3	2	4	2	2			
Little Falls	3	3			1								1	1	2	1				
Mower	10	7	3					2	1	1			2	2	3	4	3			
Austin	4	4						2		1			1	1	2	2				
Murray	6	4	2		1			2					1	1	3	1				
Nicollet	11	8	3		3			2		4			1	1	6	3	2			
Nobles	6	4	2	1		1				2			1	2	2	3	1			
Norman	6	4	2	1	1	1				2				1	4	2				
Olmsted	26	17	9				2	1	1	1	3	7	5	1	5	5	13	7	1	
Rochester	19	15	4				2		1	1	3	6	3	3	4	10	4		1	
Otter Tail	28	11	17	7					4	2		2	2	5	6	11	12	5		
Fergus Falls	12	3	9	2					3	2		1	1	2	5	2				
Pennington	5	1	4	1		1			1	1				2	3					
Pine	9	3	6		1			1	2				1	4	4	1				
Pipestone	4	3	1		1					1			1	1	1	2	1			
Polk	11	7	4	2	1	1				2		1	2	1	4	5	2			
Crookston	3	2	1	1						1		1		1	1	1	1			
Pope	7	4	3					1	2					1	1	3				

TABLE VI—DEATHS FROM LOBAR PNEUMONIA IN 1914—Continued

COUNTY	Total	Sex		Age											Conjugal Cond.				
		Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given
Ramsey	170	110	60	17	5	5	1	3	11	18	21	31	27	22	9	62	72	34	2
St. Paul	165	107	58	16	4	5	1	3	11	18	20	30	27	21	9	60	70	33	2
Red Lake	5	3	2	1								2	1			1	3	1	
Redwood	4	2	2			1		1				1		1		2	2		
Renville	4	2	2									2	2	1	1	2	2	4	
Rice	16	8	8				1	2	1	1	2	2	2	1	5	6	6	4	
Faribault	7	3	4					1	1	1	1	1	1	1	1	3	2	2	
Rock	3	2	1	1						1	1					1	2		
Roseau	2	2										1					1		
St. Louis	126	92	34	12	9	2		3		10	30	24	20	8	6	58	53	9	6
Dufuth	62	45	17	4	4	1	1		4	10	15	11	6	4	2	29	24	5	4
Eveleth	4	2	2		1								1			4			
Hibbing	10	10		1			1		2	2	3	1	1			3	5	2	
Virginia	10	10		2					2	6	1	1	1			5	4		1
Chisholm	12	9	3	1	1	1			2	2	1	3		1		6	6		
Scott	11	8	3					1	1		1	1	2	3	2	3	4	4	
Sherburn	4	3	1					1			1	1		2		1	2	1	
Sibley	8	6	2			2					2	1			3	3	2	2	
Stearns	22	11	11	1	3	3			1	1		2	3	5	3	9	8	4	1
St. Cloud	9	5	4		2	1						1	2	2	1	3	3	2	1
Steele	12	8	4		1	1	1	1		1	1	1	1	2	3	4	4	4	
Owatonna	10	6	4			1	1	1		1	1		1	2	2	3	3	4	
Stevens	8	4	4							2	2			4		2	4	2	
Todd	6	3	3						1			1	1	2	1	1	1	4	
Traverse	4	2	2	1		1							1	1	2	2	1	1	
Wabasha	12	5	7	1	1						1	1	4	1	3	2	5	5	
Wadena	2	1	1						1					1		1	1		
Waseca	5	4	1	1				1						1		2	3		
Washington	9	6	3		1				1	1	1	3		1	1	4	5		
Stillwater	2	1	1								1	1	1	1		2	2		
Watonwan	7	4	3					1			2		1	1	1	1	4	2	
Wilkin	3	2	1		1				1		1					3	6		
Winona	15	8	7	1		3		1		2		1	3	1	3	6	5	4	
Winona	8	4	4	1		2		1		1		1	1	1	1	5	2	1	
Wright	23	17	6	1		1	1	1			2	3	5	2	7	5	12	6	
Yellow Medicine	4	3	1											2	1	2	2		
Totals	1336	844	492	116	49	50	23	53	99	132	149	177	180	170	138	523	531	259	23

Totals by Months: January, 210; February, 197; March, 173; April, 172; May, 129; June, 57; July, 35; August 29; September, 46; October, 61; November, 101; December, 126.

Deaths by Occupations: Farmer, 237; laborer, 101; domestic, 11; carpenter, 29; merchant, 23; clerk; 30; railway employee, 9; miner, 18; teamster, 20; woodsman, 46; professional, 10; mechanic, 25; mason, 14; teacher, 4, agent, 14; barkeeper, 11; hotelkeeper, 2; official, 2; painter, 5; printer, 6; dressmaker, 6; miller, 4; contractor, 22; cigarmaker, 1; policeman, 12; telephone and telegraph operator, 1; commercial traveler, 1; miscellaneous, 42; No occupation, 630.

Birthplace of Deedent: Minnesota 417; Other United States 286; Foreign, 574; Not Given, 39

TABLE VII—DEATHS FROM ACUTE BRONCHITIS IN 1914

COUNTY	Total	Sex		Age										Conjugal Cond.				
		Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given
Anoka	2		2											1	1		2	
Becker	2	1	1	2												2		
Beltrami	2																	
Bemidji	1	1		1														
Brown	2			1		1										2		
New Ulm	1	1				1												
Carlton	3		1	1											2			2
Cloquet	1	1		1												1		
Carver	3		1	2										1				1
Cass	1		1	1														
Chippewa	1		1					1										
Clearwater	1		1	1														
Crow Wing	1		1	1														
Douglas	2	2												1	1		1	1
Faribault	1	1													1			1
Fillmore	2	2		1											1			1
Freeborn	1	1																1
Goodhue	1	1																1
Hennepin	15	6	9	5	2								1	3		8	2	5
Minneapolis	9	5	4	5	1										4	6	1	2
Isanti	1	1		1												1		1
Itasca	3		3	1						1			1			1	1	1
Jackson	1		1		1											1		1
Kandiyohi	3	3			2										1	2	1	
Lake	1	1		1											1	1		1
Le Sueur	5	2	3		1			1				1	1	1		2	1	1
Lincoln	2	1	1	1								1			1	1	1	1
Lyon	2	2		1	1											2		
Morrison	1		1											1			1	
Mower	1	1															1	
Murray	1	1													1		1	1
Nicollet	2		2										1	1		1	1	1
Olmsted	3		3											3		3		3
Otter Tail	6	3	3	2	1									2	1	3	1	2
Fergus Falls	1		1												1			1
Pine	1	1		1										1				1
Polk	2	1	1	1		1										2		1
Ramsey	5	2	3	2									1	1	1	2	1	2
St. Paul	4	2	2	1								1	1	1	1	1	1	2
Renville	3	1	2	1	1									1		2		1
Rice	1	1					1								1			1
St. Louis	10	7	3	6			1					1	1	1	8		2	2
Duluth	5	5		2			1					1	1	1	3		2	
Hibbing	1		1	1											1			1
Virginia	2	1	1	1			1								2			2
Scott	4	2	2	1											3	1		3
Sibley	2	1	1	1									1	1	1	1	1	1
Stearns	4	2	2	1			1			1					2	1	1	1
St. Cloud	1	1													1			1
Swift	1	1		1												1		1
Wabasha	3	2	1											3			2	1
Wadena	1	1		1										1			1	1
Waseca	2	2												1	1		1	1
Washington	2	1	1								1				1	1	1	1
Stillwater	1		1							1							1	
Wilkin	3	1	2	3											3			
Winona	4		4			1							1	2	1		3	3
Winona	3		3											2	1		2	2
Wright	4		4	1									1	2	1		3	3
Yellow Medicine	1	1								1						1		
Totals	125	62	63	41	9	4	3	2		1	3	3	3	24	32	62	24	39

Totals by Months: January, 23; February, 18; March, 20; April, 16; May, 8; June, 4; July, 4; August, 3; September, 4; October, 6; November, 9; December, 10.

Birthplace of Decedents: Minnesota, 59; Other United States, 25; Foreign, 41.

TABLE VIII—DEATHS FROM CHRONIC BRONCHITIS IN 1914

COUNTY	Total	Sex		Age											Conjugal Cond.				
		Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given
Aitkin	1	1											1				1		
Anoka	1	1												1			1		
Beltrami	5	3	2	2			2	1								5			
Benton	1	1												1			1		
Blue Earth	3		3										3					3	
Mankato	2		2										2					2	
Brown	1	1											1				1		
Carlton	1		1									1					1		
Carver	1		1											1			1		
Chippewa	1	1											1				1		
Dakota	1	1											1			1			
Dodge	1		1											1			1		
Douglas	2	1	1										2				1	1	
Faribault	1	1												1			1		
Fillmore	2	1	1											2				2	
Freeborn	1		1										1				1		
Goodhue	2	1	1										2				1	1	
Grant	1		1											1			1		
Hennepin	19	11	8							2			5	4	6	1	11	7	
Minneapolis	18	11	7							2			2	4	4	6	10	7	
Houston	3	1	2										1	2	2		1	2	
Isanti	1		1											1			1		
Jackson	1		1											1			1		
Kandiyohi	1	1											1				1		
Lincoln	1	1												1			1		
Lyon	3	1	2										2	1			2	1	
McLeod	3	2	1										2	1			1	2	
Marshall	1		1		1											1		1	
Martin	2	2								1			1		1	1			
Meeker	1	1												1			1		
Mille Lacs	1		1										1				1		
Morrison	1		1											1			1		
Mower	2	1	1										1	1			1	1	
Austin	1	1	1											1			1		
Nicollet	1		1										1				1		
Norman	1		1											1			1		
Otter Tail	4	2	2		1							1		2		1	2	1	
Fergus Falls	1	1	1										1				1		
Pine	3	3										1		1		3			
Polk	3		3										2	1		1		2	
Crookston	1		1										1				1		
Pope	1	1										1					1		
Ramsey	19	9	10					2	1	1	3	2	5	5	3	4	12		
St. Paul	19	9	10					2	1	1	3	2	5	5	3	4	12		
Redwood	2	1	1							1			1	2		1	1	1	
Rice	4	2	2										1	1	2	1	2	1	
Faribault	1	1	1										1				1		
Roseau	1	1												1			1		
St. Louis	8	5	3							1	2	4	1		1	5	2		
Duluth	4	3	1									3	1		1	1	2		
Virginia	1		1									1				1			
Scott	3	2	1							1				1		2	1		
Sibley	1	1											1				1		
Stearns	4	2	2										2				4		
Steele	3	1	2											3			3		
Owatonna	1	1	1											1			1		
Stevens	1	1										1				1			
Todd	1		1									1					1		
Wabasha	2	1	1										1	1		2			
Waseca	1	1												1		1			
Washington	3		3										1	1				3	
Stillwater	1		1										1				1		
Watsonwan	1		1										1				1		
Wilkin	1	1											1				1		
Winona	1	1												1		1			
Winona	1	1	1											1		1			
Wright	3	2	1		1								2			1	1	1	
Yellow Medicine	3		3							1				2		1	1	1	
Totals	141	72	69	2	3		2	1	3	3	5	13	16	48	45	20	56	65	

Total by Months: January, 17; February, 13; March, 21; April, 16; May, 16; June, 8; July, 7; August, 10; September, 14; October, 5; November, 7; December, 7.

Birthplace of Decedents: Minnesota, 12; Other United States, 30; Foreign, 96; Not Given, 3.

TABLE IX—DEATHS FROM CANCER IN 1914

COUNTY	Sex		Age													Conjugal Cond.			
	Total	Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given
Aitkin	7	5	2										6		1		5	2	
Anoka	8	3	5										4				7	2	
Becker	9	6	3							4			2				3	3	
Beltrami	9	5	4				1			1			2				1	1	
Bemidji	4	2	2										1						
Benton	7	2	5				1						2				5	1	
St. Cloud	1	1					1										1		
Big Stone	8	4	4							1			2		3		6	2	
Blue Earth	28	13	15					1		4			4		3	2	15	11	
Mankato	11	6	5							2			2		4		8	3	
Brown	21	12	9				1			1			4		3	2	14	5	
New Ulm	9	5	4							1			2		4		6	2	
Carlton	9	3	6										3		4		8		
Cloquet	1	1													1		1		
Carver	9	5	4					1		1					5	2	4	3	
Cass	13	8	5								5		3		2		8	4	
Chippewa	14	9	5					2		1					4	2	10	2	
Chisago	14	6	8						1				3		3	2	7	7	
Clay	11	9	2								3		3		2		9	2	
Clearwater	2	1	1												1		2		
Cook	1	1															1		
Cottonwood	7	2	5										1		4		5	2	
Crow Wing	17	11	6							1			5		2		10	5	
Brainerd	13	10	3						1				4		2		8	7	
Dakota	16	9	7							1			3		6	3	9	4	
Dodge	16	8	8						1	1			1		6	3	8	8	
Douglas	24	13	11				1			1			7		7	2	20	3	
Faribault	8	4	4							1			2		3		8		
Fillmore	25	12	13					1		1			5		6	2	14	9	
Freeborn	27	14	13							1			9		5	10	2	16	9
Albert Lea	11	6	5							1			2		2		6	3	
Goodhue	31	13	18							1			4		3	6	7	13	16
Red Wing	13	4	9							1			2		3	2	1	8	4
Grant	9	2	7										1		6		5	4	
Hennepin	334	147	187	1			2	1	7	21	47	84	96	58	17	44	201	89	
Minneapolis	314	136	178	1			2	1	7	20	40	80	94	55	14	41	186	87	
Houston	13	8	5							1			2		3	6	2	9	2
Hubbard	2	2											1		1		1	1	
Isanti	13	8	5						1				2		4	4	2	7	5
Itasca	9	6	3							1	2		1		4		5	3	
Jackson	11	3	8										4		3	4	7	4	
Kanabec	3	2	1										3		3		1	2	
Kandiyohi	14	6	8			1				1			4		3	5	8	2	
Kittson	8	7	1						1				3		1	2	5	2	
Koochiching	5	4	1										3		3		3	3	
Lac qui Parle	9	4	5										4		2		4	5	
Lake	4	3	1										3		1		2		
Le Sueur	8	3	5										2		3	1	5	2	
Lincoln	5	3	2							1			1		2	1	3	1	
Lyon	14	6	8						1				3		4	4	12	2	
McLeod	15	9	6					2		1			3		4	5	1	13	1
Mahnomen	3	2	1							1					1		1	2	
Marshall	13	7	6							2			7		3	1	1	10	2
Martin	14	6	8							1			1		6	3	1	10	4
Meeker	18	8	10				1			1			6		6	2	13	3	
Mille Lacs	8	3	5										2		2	1	6	2	
Morrison	19	13	6						1				4		3	5	4	15	4
Little Falls	7	6	1							1			2		2	2	6	1	
Mower	6	2	4										2		3	1	5	1	
Austin	4	1	3										2		2		4		
Murray	10	7	3										5		3	2	5	3	
Nicollet	20	12	8				1			1			2		4	2	7	8	
Nobles	6	3	3										1		1	2	4	2	
Norman	10	4	6							1			2		3	4	6	4	
Olmsted	98	61	37			1				2	8	12	26	33	12	4	69	20	
Rochester	83	54	29							2	6	10	24	29	9	2	60	17	
Otter Tail	42	25	17			1				5	2	8	10	15	1	6	23	13	
Fergus Falls	14	8	6							1			4		5	3	8	3	
Pennington	9	3	6										3		3		2	4	
Pine	6	5	1							2			1		3	3	6	2	
Pipestone	6	3	3										2		2		6		

TABLE IX—DEATHS FROM CANCER IN 1914—Continued

COUNTY	Total	Sex		Age													Conjugal Cond.				
		Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given		
Polk	23	13	10					1		2				5	7	3	1	3	16	4	
Crookston	8	5	3						1	4				3	2	1		1	6	1	
Pope	4	1	3											1	1				3	1	
Ramsey	171	72	99	1				2	1	11	31	48	45	26	6	19	10	5	44		
St. Paul	165	70	95	1				2	1	11	28	47	44	25	6	19	104	42			
Red Lake	1		1											1					1		
Redwood	5	2	3					1						2	1	1	2	2	1		
Renville	14	7	7				1							3	1	4	4	8	2		
Rice	28	11	17							2	2	5	3	1	4	5	2	3	19	6	
Faribault	12	5	7							1	1	5	1	4			2	8	2		
Rock	12	3	9									2	1	6		3		7	5		
Roscau	4	3	1											1	3			3	1		
St. Louis	105	49	56		1	1	1			13	19	31	25	12	2	17	62	23	3		
Duluth	69	32	37							8	12	19	19	10	1	12	35	19	3		
Eveleth	2	1	1		1									1			1	1			
Hibbing	2	2	2											1		1	1	1			
Virginia	4	2	2			1				2				1			1	3			
Chisholm	1	1										1						1			
Scott	8	5	3					1		1	1	1	1	2	1	2	5	1			
Sherburn	7	3	4								2	2	1	3	1		4	3			
Sibley	12	8	4					1			2	2	2	5	1	4	9	2			
Stearns	29	12	17							1	2	5	12	5	3	1	4	23	2		
St. Cloud	11	3	8								1	5	2	2	2		2	8	1		
Steele	11	7	4							1	1	2	2	3	2	1	6	4			
Owatonna	6	4	2							1	1			1	2		4	2			
Stevens	5	4	1									1	3	1			3	2			
Swift	6	2	4							1		1	2	1	1		4	2			
Todd	8	3	5							1	4	1		2	2		7	1			
Traverse	1	1												1			1				
Wabasha	26	13	13							2		5	11	5	3	3	14	9			
Wadena	8	3	5				1			1			3	3		2	4	2			
Waseca	11	7	4									3	2	6		1	6	4			
Washington	15	9	6								3	3	3	4	2	1	12	2			
Stillwater	7	4	3								1	1	3	2		1	6				
Watowan	6	3	3								1		5			1	2	3			
Wilkin	3	2	1								1			2			2	1			
Winona	38	20	18							1	4	12	5	7	8	2	21	14			1
Winona	23	10	13							1	3	7	5	3	4	2	13	8			
Wright	27	10	17							1	1	1	5	8	3		18	9			
Yellow Medicine	10	5	5									1	3	3			6	4			
Totals	1703	840	863	2	1	3	9	13	23	92	228	390	451	361	130	179	1068	451			5

Totals by Months: January, 138; February, 127; March, 143; April, 127; May, 153; June, 142; July, 153; August, 143; September, 146; October, 130; November, 143; December, 158.

Deaths by Occupations: Farmer, 408; laborer, 70; domestic, 9; carpenter, 30; merchant, 38; clerk, 21; railway employee, 11; miner, 5; teamster, 12; woodsman, 19; professional, 20; mechanic, 28; mason, 16; teacher, 4; agent, 16; barkeeper, 7; hotelkeeper, 9; official, 2; painter, 5; printer, 1; dressmaker, 4; miller, 2; contractor, 28; salesman, 1; policeman, 4; telephone and telegraph operator, 2; cigarmaker, 2; miscellaneous 65, no occupation, 864.

Birthplace of Decedents: Minnesota, 169; Other United States, 491; Foreign, 1026; Not Given, 17.

TABLE X—DEATHS FROM DIARRHOEAL DISEASES UNDER 2 YEARS OF AGE IN 1914

COUNTY	Total	Sex		Age		COUNTY	Total	Sex		Age	
		Male	Female	Under 1	1 to 2			Male	Female	Under 1	1 to 2
Aitkin.....	1	1		1		Little Falls.....	3	2	1	1	2
Anoka.....	5	2	3	5		Mower.....	2	1	1	1	1
Becker.....	13	8	5	11	2	Murray.....	2	2		1	1
Beltrami.....	22	10	12	16	6	Nicollet.....	5	2	3	5	
Bemidji.....	4	1	3	3	1	Nobles.....	5	1	4	2	3
Benton.....	6	3	3	5	1	Norman.....	2	1	1	1	1
Big Stone.....	3	2	1	3		Olmsted.....	8	3	5	4	4
Blue Earth.....	8	7	1	5	3	Rochester.....	3	2	1	1	2
Mankato.....	2	2		1	1	Otter Tail.....	17	9	8	12	5
Brown.....	8	4	4	7	1	Fergus Falls.....	2	2			2
New Ulm.....	4	2	2	3	1	Pennington.....	3	3		2	1
Carlton.....	13	6	7	11	2	Pine.....	8	5	3	7	1
Cloquet.....	10	4	6	8	2	Pipestone.....	2	2		1	1
Carver.....	6	3	3	4	2	Polk.....	7	3	4	5	2
Cass.....	9	5	4	4	5	Crookston.....	1	1		1	
Chippewa.....	3	2	1	3		Pope.....	4	2	2	4	
Chisago.....	3	1	2	1	2	Ramsey.....	100	54	46	71	29
Clay.....	11	4	7	7	4	St. Paul.....	99	53	46	70	29
Clearwater.....	1		1	1		Red Lake.....	4	3	1	3	1
Cottonwood.....	10	4	6	8	2	Redwood.....	7	4	3	7	
Crow Wing.....	7	5	2	7		Renville.....	9	8	1	9	
Brainerd.....	3	2	1	3		Rice.....	9	6	3	7	2
Dakota.....	17	7	10	15	2	Faribault.....	7	5	2	6	1
Dodge.....	2	1	1	2		Rock.....	5	4	1	4	1
Douglas.....	8	5	3	7	1	Roseau.....	5	2	3	3	2
Faribault.....	2		2	1	1	St. Louis.....	155	95	60	133	22
Fillmore.....	2	2		2		Duluth.....	46	27	19	38	8
Freeborn.....	4	2	2	3	1	Eveleth.....	9	5	4	8	1
Albert Lea.....	1	1			1	Hibbing.....	16	9	7	9	7
Goodhue.....	7	5	2	7		Virginia.....	19	11	8	18	1
Red Wing.....	2	1	1	2		Chisholm.....	13	8	5	11	2
Grant.....	1		1	1		Scott.....	1		1	1	
Hennepin.....	153	90	63	121	32	Sherburn.....	3	1	2	3	
Minneapolis.....	141	83	58	112	29	Sibley.....	2	2		2	
Houston.....	4	2	2	3	1	Stearns.....	16	14	2	12	4
Hubbard.....	4	2	2	3	1	St. Cloud.....	2	2		2	
Isanti.....	9	5	4	7	2	Steele.....	9	3	6	8	1
Itasca.....	10	5	5	8	2	Owatonna.....	4	1	3	4	
Jackson.....	4	3	1	2	2	Stevens.....	2		2	1	1
Kanabec.....	2	1	1	1	1	Swift.....	4	3	1	4	
Kandiyohi.....	3	1	2	1	2	Todd.....	7	2	5	7	
Kittson.....	3	2	1	3		Wabasha.....	9	8	1	7	2
Koochiching.....	11	8	3	9	2	Wadena.....	8	5	3	7	1
Lac qui Parle.....	6	5	1	6		Wasca.....	4	3	1	3	1
Lake.....	3	2	1	2	1	Washington.....	3	2	1	2	1
Lincoln.....	2		2	1	1	Stillwater.....	1	1		1	
Lyon.....	3	1	2	3		Wilkin.....	8	4	4	7	1
McLeod.....	5	4	1	5		Winona.....	13	7	6	9	4
Marshall.....	3	1	2	2	1	Winona.....	8	3	5	6	2
Martin.....	4	3	1	3	1	Wright.....	10	7	3	9	1
Meeker.....	2	1	1	1	1	Yellow Medicine.....	5	2	3	4	1
Mille Lacs.....	7	5	2	7							
Morrison.....	7	4	3	4	3						
						Totals.....	880	507	373	697	183

Total by Months: January, 60; February, 46; March, 62; April, 51; May, 70; June, 60; July, 88; August, 120; September, 105; October, 93; November, 69; December, 56.

Birthplace of Decedents: Minnesota, 848; Other United States, 28; Foreign, 4.

TABLE XI—DEATHS FROM DIARRHOEAL DISEASES, TWO TO FIVE YEARS OF AGE IN 1914

COUNTY	Total	Sex		COUNTY	Total	Sex	
		Male	Female			Male	Female
Anoka.....	3	2	1	Murray.....	2	1	1
Beltrami.....	3	1	2	Nicollet.....	1	.....	1
Benton.....	2	1	1	Nobles.....	1	1	.....
Blue Earth.....	2	1	1	Olmsted.....	2	1	1
Mankato	2	1	1	Rochester	1	1	.....
Carlton.....	1	.....	1	Otter Tail.....	1	1	.....
Carver.....	1	1	.....	Pine.....	4	1	3
Cass.....	1	.....	1	Pipestone.....	1	.....	1
Chippewa.....	1	1	.....	Polk.....	3	3	.....
Chisago.....	3	3	.....	Crookston	2	2	.....
Clearwater.....	1	1	.....	Ramsey.....	19	8	11
Cottonwood.....	1	1	.....	St. Paul	19	8	11
Crow Wing.....	1	1	.....	Renville.....	1	1	.....
Brainerd	1	1	.....	Rice.....	2	2	.....
Dakota.....	1	.....	1	Faribault	1	1	.....
Fillmore.....	2	2	.....	Rock.....	2	.....	2
Freeborn.....	1	.....	1	Roseau.....	1	.....	1
Goodhue.....	1	1	.....	St. Louis.....	19	11	8
Hennepin.....	22	11	11	Duluth	6	3	3
Minneapolis	21	10	11	Hibbing	1	1	.....
Itasca.....	3	2	1	Virginia	4	2	2
Jackson.....	2	1	1	Chisholm	1	1	.....
Kanabec.....	1	1	.....	Scott.....	2	2	.....
Koochiching.....	4	.....	4	Stearns.....	3	2	1
Le Sueur.....	2	1	1	St. Cloud	2	2	.....
Lincoln.....	1	.....	1	Swift.....	1	1	.....
McLeod.....	1	.....	1	Todd.....	2	1	1
Mahnomen.....	2	.....	2	Waseca.....	1	1	.....
Martin.....	2	2	.....	Wright.....	1	1	.....
Mille Lacs.....	1	.....	1				
Mower.....	4	2	2	Totals.....	139	74	65

Total by Months: January, 3; February, 2; March, 9; April, 5; May, 3; June, 8; July, 12; August, 34; September, 19; October, 19; November, 16; December, 9.

Birthplace of Decedents: Minnesota, 122; Other United States, 16; Foreign, 1.

TABLE XII—DEATHS FROM TYPHOID FEVER IN 1914

COUNTY	Total	Sex		Age													Conjugal Cond.			
		Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given	
Aitkin	3	1	2				1	1			1						2	1		
Becker	1	1	1					1									1			
Beltrami	5	3	2				1		1	3							2	2		1
Bemidji	1	1							1											1
Benton	1	1							1									1		
Big Stone	1	1									1							1		
Blue Earth	1	1							1								1			
Mankato	1	1							1								1			
Brown	4		4				1	1	1								3	1		
New Ulm	3		3					1	1	1							2	1		
Carlton	3	3						1						2			1			
Carver	2	1	1						1	1							2	2		
Chippewa	1	1													1				1	
Clay	4	2	2				1		2					1	1		3	1		
Cottonwood	6	2	4					1	3					2			2	4		
Crow Wing	6	4	2			1		1	1		1						4	2		
Brainerd	3	3						1						2			1			
Dakota	2	2												1				2		
Douglas	2	2								2								2		
Faribault	2	2							1	1							1	1		
Fillmore	2	2						1	1								2			
Freeborn	3	2	1					1		1				1			1	1		1
Albert Lea	3	2	1					1	1	1				1			1	1		1
Goodhue	3	2	1			1		1	1	1				1			2	1		
Red Wing	2	1	1					1									2			
Grant	1	1															1			
Hennepin	43	30	13			1		3	20	12	4	3					23	17	3	
Minneapolis	42	29	13			1		3	20	12	3	3					23	16	3	
Jackson	1		1					1									1			
Kandiyohi	1	1							1								1			
Kittson	2	1	1					2									2			
Koochiching	4	2	2					1	2	1							2	2		
Lyon	1	1							1	1							1	1		
McLeod	1	1								1							1			
Marshall	5	3	2			1			3		1						3	2		
Morrison	1	1								1							1			
Little Falls	1	1							1								1			
Mower	2	2								1		1					1	1		
Austin	2	2								1		1					1	1		
Murray	1	1						1									1			
Nobles	1		1					1									1			
Norman	2		2			1	1										2			
Olmsted	1	1								1							1			
Rochester	1	1								1							1			
Otter Tail	5	2	3					1		1		1	1	1			1	3	1	
Fergus Falls	3	1	2							1		1	1	1			2	2	1	
Pennington	1	1						1									1			
Polk	9	5	4			1		2	3	1		1	1	1			7	1	1	
Crookston	6	4	2					1	2	1		1	1	1			4	1	1	
Pope	2	2								1		1	1	1			1	1		
Ramsey	26	17	9			2	2	4	10	7		1					16	9	1	
St. Paul	26	17	9			2	2	4	10	7		1					16	9	1	
Red Lake	2	1	1							1							2			
Rice	8	5	3			1		2	4	1							7	1		
Faribault	7	5	2			1		1	4	1							6	1		
Rock	2		2					1	1								2			
St. Louis	32	20	12			1	1	5	13	5	3	4					21	11		
Duluth	17	10	7					2	9	2	1	3					11	6		
Eveleth	1		1						1								1			
Hibbing	2	2						1	1								1	1		
Virginia	4	4							1	2	1						3	1		
Chisholm	2	1	1					1	1								2			
Scott	1		1						1									1		
Sibley	1	1									1						1	1		
Steele	1	1								1							1			
Owatonna	1	1							1								1			
Stevens	1	1									1						1			
Swift	5	4	1							2	1	2					1	4		
Todd	1	1							1									1		
Traverse	1	1							1								1			
Wilkin	1		1						1									1		

TABLE XII—DEATHS FROM TYPHOID FEVER IN 1914—Continued

COUNTY	Total	Sex		Age												Conjugal Cond.			
		Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given
Winona	3	3	.....	.....	.....	.....	.....	.....	.....	1	1	1	.....	.....	.....	.....	3	.....	.....
Yellow Medicine	4	3	1	.....	.....	.....	.....	1	2	.....	1	.....	.....	.....	.....	.....	3	1	.....
Totals.....	225	145	80	.....	.....	10	8	35	79	47	18	20	7	1	.....	128	88	8	1

Total by Months: January, 24; February, 15; March, 19; April, 8; May, 13; June, 17; July 10; August, 18; September, 21; October, 36; November, 28; December, 16.

Deaths by Occupations: Farmer, 40; laborer, 17; domestic, 7; carpenter, 4; merchant, 2; clerk, 17; railway employe, 1; miner, 2; teamster, 2; woodsman, 7; mechanic, 7; mason, 5; teacher, 1; barkeeper, 1; hotelkeeper, 1; official, 2; painter, 2; contractor, 1; miscellaneous, 11; no occupation, 93.

Birthplace of Decedents: Minnesota, 104, Other United States, 42; Foreign, 75; Not Given, 4.

TABLE XIII—DEATHS FROM DIPHTHERIA IN 1914

COUNTY	Total	Sex		Age													Conjugal Cond.					
		Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given			
Aitkin.....	3	2	1				1	2											3			
Anoka.....	8	7	1			2	2	1	2	1									8			
Blue Earth.....	3	1	2			1	1												2		1	
Brown.....	2	1	1			1													2			
New Ulm.....	2	1	1			2													2			
Carlton.....	3	2	1			1	1		1										3			
Cloquet.....	1	1				1													1			
Cass.....	7	4	3			3	2	2											7			
Chippewa.....	2	1	1		1								1						1		1	
Chisago.....	3	3					1	2											3			
Clay.....	6	6		1	2	1	1	1					1						5		1	
Cook.....	1	1		1															1			
Cottonwood.....	1	1						1											1			
Crow Wing.....	1	1					1												1			
Brainerd	1	1					1												1			
Dakota.....	3	2	1		1					1									3			
Dodge.....	1	1			1														1			
Douglas.....	1	1					1												1			
Faribault.....	2	2			1	1													2			
Fillmore.....	1	1					1												1			
Freeborn.....	5	2	3			2		2					1						4		1	
Albert Lea.....	3	2	1			1			2										3			
Goodhue.....	1	1					1												1			
Red Wing	1	1					1												1			
Hennepin.....	158	90	68	13	13	55	40	22	9	4	1	1						151	6	1	1	
Minneapolis	152	85	67	13	13	54	37	22	8	3	1	1						146	5	1	1	
Houston.....	1	1																	1			
Itasca.....	1	1						1											1			
Jackson.....	3	2	1		2					1									3			
Kandiyohi.....	3	3				1	1		1										3			
Koochiching.....	1	1					1												1			
Lac qui Parle.....	2	2						1			1								1		1	
Lincoln.....	1	1		1															1			
Marshall.....	2	2		1				1											2			
Martin.....	1	1				1													1			
Meeker.....	4	2	2		1	2	1												4			
Mille Lacs.....	2	1	1				1	1											2			
Mower.....	2	2				1	1												2			
Norman.....	1	1					1												1			
Otter Tail.....	2	1	1				1	1											2			
Fergus Falls	1	1						1											1			
Pennington.....	2	2					2												2			
Ramsey.....	68	37	31	1	2	33	17	8	3	1	1	2						63	5			
St. Paul	67	37	30	1	2	33	17	8	3	1	1	2						63	4			
Redwood.....	1	1						1											1			
Rice.....	4	2	2			2		1				1							4			
Faribault	3	1	2			1		1				1							3			
St. Louis.....	13	8	5	1		5	3	2	1				1					12	1			
Duluth	6	3	3			3	2	1											6			
Hibbing	3	3				1	1						1						2		1	
Virginia.....	1	1				1													1			
Sibley.....	1	1		1															1			
Stearns.....	2	1	1			1			1										2			
Steele.....	1	1					1												1			
Owatonna	1	1					1												1			
Stevens.....	1	1				1													1			
Swift.....	2	1	1		1	1													2			
Todd.....	1	1						1											1			
Wabasha.....	2	1	1			1	1												2			
Wadena.....	2	1	1				1	1											2			
Washington.....	3	2	1			1	2												3			
Stillwater	1	1					1												1			
Wilkin.....	1	1						1											1			
Winona.....	7	2	5			4	2			1									6		1	
Winona	6	2	4			4	2												6			
Wright.....	5	1	4				4	1											5			
Totals.....	354	193	161	20	22	126	93	54	21	8	6	4						334	18	2		

Total by Months: January, 40; February, 23; March, 44; April, 28; May, 32; June, 24; July, 30; August, 21; September, 23; October, 31; November, 26; December, 32;

Birthplace of Decedents: Minnesota, 273; Other United States, 63; Foreign, 16; Not Given, 2.

TABLE XIV—DEATHS FROM SCARLET FEVER IN 1914

COUNTY	Sex		Age														Conjugal Cond.			
	Total	Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given	
Anoka	6	2	4			3	3									6				
Beltrami	10	6	4			2	7	1								10				
Bemidji	2	2				1		1								2				
Benton	2	2				1		1								2				
St. Cloud	1	1							1							1				
Blue Earth	1	1						1								1				
Brown	2	1	1			1	1									2				
Carlton	8	4	4	1	1	2	3	1								3				
Cloquet	3	2	1			1	1	1								3				
Carver	2	2				1			1							2				
Cass	3	2	1			1	2									3				
Chippewa	1	1						1								1				
Chisago	1	1				1										1				
Clay	1	1					1									1				
Cottonwood	3	1	2				1	1	1							3				
Crow Wing	1	1						1								1				
Brainerd	1	1														1				
Dakota	10	4	6		2	2	4	2								10				
Douglas	1	1					1									1				
Faribault	1	1				1										1				
Fillmore	1	1					1									1				
Freeborn	5	1	4			2	2	1								5				
Albert Lea	4	4				2	2									4				
Hennepin	89	49	40	3	10	27	13	19	13	3	1					82	7			
Minneapolis	83	47	36	3	9	26	12	16	13	3	1					76	7			
Houston	2	1	1			1	1									2				
Hubbard	2	1	1					2								1	1			
Isanti	5	2	3		1		3	1								5				
Itasca	4	2	2	1		1	1	1								4				
Jackson	5	3	2		2		1	1	1							4	1			
Koochiching	3	3						2		1						2	1			
Lake	6	3	3				1	3	1	1						5	1			
Le Sueur	1	1														1				
Lyon	3	3				2		1								3				
Marshall	2	2					1									2				
Martin	2	2		1		1										2				
Meeker	1	1				1										1				
Morrison	2	1	1			1			1							1	1			
Mower	4	3	1		1	1	1	1								4				
Nobles	3		3			2		1								3				
Otter Tail	1	1				1										1				
Pine	1	1					1									1				
Pipestone	5	2	3				3	1	1							5				
Polk	5	3	2		1	2	1		1							4	1			
Ramsey	45	20	25	3	5	16	12	6	3							44	1			
St. Paul	43	20	23	3	5	14	12	6	3							42	1			
Redwood	1	1				1										1				
Renville	2	1	1		1		1		1							2				
Rice	2	1	1				1									2				
Faribault	1	1														1				
St. Louis	32	17	15	1	3	13	3	7	3							29	3			
Duluth	18	10	8		3	6	2	3	3	1						16	2			
Eveleth	3	2	1	1		2										3				
Hibbing	1	1						1								1				
Scott	1	1		1			1									1				
Sherburn	1	1					1									1				
Stearns	4	1	3			2		2								4				
St. Cloud	1	1				1										1				
Steele	1	1						1								1				
Todd	2	1	1				2									2				
Traverse	2	1	1		1		1									2				
Wabasha	3	2	1		1		1									3				
Waseca	2	1	1		1	1		1								2				
Washington	4	2	2		1	1	1	1								4				
Stillwater	2	1	1			1		1								2				
Wilkin	2	1	1				1									2				
Winona	11	4	7	2		3	3	3								11				
Winona	9	3	6	1		2	3	3								9				
Wright	2	1	1				1	1								1	1			
Totals	322	158	164	13	30	94	82	66	29	7	1					304	18			

Total by Months: January, 37; February, 32; March, 53; April, 69; May, 50; June, 19; July, 10; August, 10; September, 8; October, 5; November, 14; December, 15.

Birthplace of Deceaseds: Minnesota, 254; Other United States, 43; Foreign, 24, Not Given, 1.

TABLE XV—DEATHS FROM WHOOPING COUGH IN 1914

COUNTY	Total	Sex		Age											Conjugal Cond.					
		Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given	
Aitkin.....	2	1	1	1	1													2		
Anoka.....	2	2		1	1													2		
Becker.....	15	6	9	6	6	2	1											15		
Beltrami.....	10	1	9	6	1	2	1											10		
Bernidji	2	1	1	2														2		
Big Stone.....	1		1					1										1		
Clay.....	9	3	6	7	1	1												9		
Crow Wing.....	5	1	4	1	2	2												5		
Brainerd	2	2	1	1														2		
Dakota.....	1		1	1														1		
Dodge.....	1		1	1														1		
Douglas.....	2	2			1	1												2		
Faribault.....	2	1	1		1	1												2		
Freeborn.....	3	1	2	3														3		
Albert Lea	1	1	1	1														1		
Goodhue.....	4	3	1	1	1	2												4		
Grant.....	1		1	1														1		
Hennepin.....	51	24	27	31	13	4	2	1										51		
Minneapolis	49	23	26	30	13	3	2	1										49		
Hubbard.....	1		1	1														1		
Isanti.....	3	1	2	3														3		
Itasca.....	2	2		1	1													2		
Kandiyohi.....	2	1	1	2														2		
Kittson.....	1		1	1														1		
Koochiching.....	3		3	2		1												3		
Lyon.....	1	1		1														1		
Mahnomen.....	6		6	3	1	2												6		
Marshall.....	1		1	1														1		
Martin.....	1	1		1														1		
Meeker.....	1		1	1														1		
Morrison.....	2	1	1	1			1											2		
Little Falls	2	1	1	1			1											2		
Mower.....	6	6		3	2	1												6		
Austin.....	2	2		1	1													2		
Otter Tail.....	3	1	2	3														3		
Pennington.....	5	2	3	3	1	1												5		
Pipestone.....	1		1	1														1		
Polk.....	8	7	1	8														8		
Crookston	4	4	4	4														4		
Ramsey.....	11	4	7	9	1	1												6	5	
St. Paul	9	4	5	8		1												4	5	
Red Lake.....	3	1	2	2	1													3		
Redwood.....	1		1							1									1	
Renville.....	1		1				1											1		
Rice.....	1	1					1											1		
Rock.....	2	1	1	2														2		
St. Louis.....	5	2	3	4		1												5		
Duluth	5	2	3	4		1												5		
Scott.....	1	1		1														1		
Sherburn.....	1	1		1														1		
Stearns.....	4	1	3	4														4		
St. Cloud	4	1	3	4														4		
Steele.....	1		1			1												1		
Stevens.....	1	1		1														1		
Swift.....	2	2		2														2		
Todd.....	3	1	2	2		1												3		
Wadena.....	2	1	1	2														2		
Washington.....	1	1		1														1		
Winona.....	7	3	4	6	1													7		
Winona	5	2	3	4		1												5		
Wright.....	4	2	2	1	2	1												4		
Yellow Medicine.....	1		1	1														1		
Totals.....	208	92	116	133	40	25	7	2		1								202	6	

Total by Months: January, 18; February, 18; March, 24; April, 28; May, 22; June, 15; July, 17; August, 18; September, 11; October, 8; November, 14; December, 15.

Birthplace of Decedents: Minnesota, 199; Other United States, 7; Foreign, 2.

TABLE XVI—DEATHS FROM MEASLES IN 1914

COUNTY	Total	Sex		Age													Conjugal Cond.			
		Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given	
Becker	2		2		1	1												2		
Benton	1	1				1												1		
Blue Earth	5	3	2		1		1	2					1					5		
Mankato	1		1															1		
Brown	2	1	1			1		1										2		
Carlton	2		2	1	1													2		
Cloquet	2		2															2		
Cass	1		1			1												1		
Clay	2	1	1		2													2		
Dakota	1		1		1													1		
Dodge	2	1	1	1		1												2		
Fillmore	2	1	1				1				1							2		
Goodhue	1		1	1														1		
Hennepin	11	5	6	3	1	3	3	1										11		
Minneapolis	11	5	6	3	1	3	3	1										11		
Houston	2	2				1		1										2		
Kanabec	1		1	1														1		
Kandiyohi	1		1			1												1		
Le Sueur	2	1	1		6	1												2		
Mahnomen	1		1	1														1		
Mille Laes	1		1	1														1		
Morrison	1		1			1												1		
Mower	1		1			1												1		
Austin	1		1			1												1		
Nicollet	1		1								1								1	
Ramsey	4	1	3	2	1	1												4		
St. Paul	4	1	3	2	1	1												4		
Redwood	5	2	3	1	2	1		1										5		
Renville	2		2	1		1												2		
Rice	1	1				1												1		
St. Louis	12	4	8	2	8	1		1										12		
Duluth	2	1	1		2													2		
Eveleth	1	1			1													1		
Hibbing	2	1	1		2													2		
Sibley	1	1				1												1		
Stearns	1	1				1												1		
St. Cloud	1	1				1												1		
Stevens	2	1	1		1						1							2		
Swift	1	1				1												1		
Todd	2	1	1		1			1										2		
Traverse	1	1			1													1		
Washington	1		1			1												1		
Winona	1		1				1											1		
Yellow Medicine	3	2	6	2										1				2	1	
Totals	80	32	48	17	22	20	8	8	2	1	1	1					78	2		

Total by Months: January, 7; February, 13; March, 19; April, 12; May, 13; June, 9; July, 1; August 2; October, 2; November, 1; December, 1.
 Birthplace of Decedents: Minnesota, 66; Other United States, 10; Foreign, 4.

TABLE XVII—DEATHS FROM SMALLPOX IN 1914

CONUTY	Total	Sex		Age													Conjugal Cond.				
		Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given		
Itasca.....	1	1				1												1			
Kandiyohi.....	1		1					1										1			
Mille Laes.....	1	1							1										1		
Mower.....	1		1	1														1			
Austin.....	1		1	1														1			
Norman.....	1		1						1										1		
Swift.....	1		1						1										1		
Wilkin.....	1		1	1														1			
Totals.....	7	2	5	2		1		1	2	1								4	3		

Total by Months: March, 1; April, 2; May, 1; June, 1; August, 1; December, 1.

Birthplace of Decedents: Minnesota, 7.

TABLE XVIII—DEATHS FROM RABIES IN 1914

COUNTY	Total	Sex		Age													Conjugal Cond.					
		Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given			
Ramsey.....	1	1																	1			
St. Paul.....	1	1																	1			

Total by Months: March, 1.

Birthplace of Decedent: Other United States, 1.

TABLE XIX—DEATHS FROM POLIOMYELITIS IN 1914

CONUTY	Total	Sex		Age											Conjugal Cond.						
		Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given		
Benton.....	1	1		1														1			
St. Cloud.....	1	1		1														1			
Hennepin.....	1		1															1			
Minneapolis.....	1		1															1			
Koochiching.....	1	1				1												1			
Pennington.....	1	1					1											1			
Pine.....	1		1	1														1			
Rice.....	1		1		1													1			
Faribault.....	1		1		1													1			
St. Louis.....	1		1		1													1			
Virginia.....	1		1		1													1			
Yellow Medicine.....	1	1		1														1			
Totals.....	8	4	4	3	2	1	1											8			

Total by Months: January, 3; February, 1; April, 2; May, 1; October, 1.

Birthplace of Decedents: Minnesota, 7; Foreign, 1.

TABLE XX—DEATHS FROM EPIDEMIC CEREBRO SPINAL MENINGITIS IN 1914

COUNTY	Total	Sex		Age							Conjugal Cond.						
		Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	Single	Married	Div. & Wid.	Not Given		
Beltrami	1	1		1										1			
Bemidji	1	1		1										1			
Blue Earth	1	1		1										1			
Carlton	1		1					1						1			
Carver	1	2				1		1						1			
Clay	1		1				1							1			
Cook	1	1				1								1			
Douglas	1	1						1						1			
Faribault	1		1	1										1			
Hennepin	5	4	1	4					1					5			
Minneapolis	5	4	1	4					1					5			
Hubbard	1		1						1					1			
Isanti	1		1			1								1			
Olmsted	1		1			1								1			
Rochester	1		1			1								1			
Pope	1		1					1				1			1		
Ramsey	6	1	5			1	1		1	1	1	1	1	5	1		
St. Paul	6	1	5			1	1	1	1	1	1	1	1	5	1		
Red Lake	1	1			1									1			
St. Louis	3	2	1		2					1				1		1	
Duluth	3	2	1		2					1				2	1		
Stearns	5	2	3	1		1	2	1						5			
Wilkin	1	1						1						1			
Winona	1	1				1								1			
	35	18	17	8	3	7	4	6	4	1	2	32	3				

Total by Months: February, 4; April, 4; May, 2; June, 4; July, 13; August, 2; September, 1; October 3; November, 1; December, 1.

Birthplace of Deceaseds: Minnesota, 31, Other United States, 2; Foreign, 2.

TABLE XXI—DEATHS FROM PUERPERAL SEPSIS IN 1914

COUNTY	Total	Age				Conjugal Cond.		
		10 to 20	20 to 30	30 to 40	40 to 50	Single	Married	Div. & Wid.
Becker.....	2		2					2
Beltrami.....	3		2	1				3
Bemidji.....	2		1					2
Brown.....	2			2				2
Carlton.....	2		1	1				2
Carver.....	1			1				1
Chippewa.....	1			1				1
Chisago.....	1		1					1
Clay.....	1			1				1
Clearwater.....	1		1					1
Cottonwood.....	1		1					1
Crow Wing.....	1		1					1
Douglas.....	1		1					1
Faribault.....	1		1					1
Fillmore.....	1			1				1
Hennepin.....	26	3	13	9	1	5		21
Minneapolis.....	26	3	13	9	1	5		21
Hubbard.....	1			1				1
Itasca.....	3			3				3
Kittson.....	1		1					1
Le Sueur.....	1		1					1
Lyon.....	3		3			1		2
Marshall.....	3		2	1				3
Martin.....	4		2	2				4
Meeke.....	1		1					1
Morrison.....	2	1		1		1		1
Little Falls.....	2	1		1		1		1
Nicollet.....	1		1					1
Norman.....	1		1					1
Olmsted.....	1			1				1
Rochester.....	1			1				1
Otter Tail.....	3		1	2				3
Fergus Falls.....	1			1				1
Pennington.....	3		2	1				3
Polk.....	2		1	1				2
Crookston.....	1			1				1
Ramsey.....	9		6	3		2		7
St. Paul.....	9		6	3		2		7
Redwood.....	1		1					1
Rice.....	2		1	1				2
St. Louis.....	8		5	2	1			8
Duluth.....	6		4	1	1			6
Chisholm.....	1		1					1
Scott.....	1		1			1		1
Stearns.....	2		2					1
St. Cloud.....	2		2			1		1
Stevens.....	1			1				1
Swift.....	1			1				1
Wabasha.....	2		1	1				2
Waseca.....	3		2	1				3
Totals.....	105	4	58	41	2	11		94

Total by Months: January, 8; February, 13; March, 16; April, 18; May, 6; June, 9; July, 5; August, 8; September, 5; October, 2; November, 7; December, 8.

Birthplace of Decedents: Minnesota, 48; Other United States, 32; Foreign, 25.

TABLE XXII—DEATHS FROM TETANUS IN 1914

COUNTY	Total	Sex		Age													Conjugal Cond.						
		Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given				
Blue Earth.....	1	1								1										1			
Mankato	1	1								1										1			
Brown.....	2	1	1							1										1			
Carlton.....	1	1		1																1			
Dakota.....	1	1												1									
Faribault.....	1	1				1																	
Goodhue.....	2	2		1									1							1			
Red Wing	1	1																		1			
Hennepin.....	2	1	1		1			1												2			
Minneapolis	2	1	1		1			1												2			
Jackson.....	1	1		1			1	1												1			
Koochiching.....	1	1		1																1			
Le Sueur.....	1	1		1																1			
McLeod.....	1	1								1										1			
Martin.....	1	1							1											1			
Morrison.....	1	1					1													1			
Little Falls	1	1					1													1			
Mower.....	1	1		1																1			
Murray.....	2	2		1				1	1											1			
Olmsted.....	1	1											1							1			
Pope.....	1	1								1										1			
Ramsey.....	3	3				1						1	1							1			
St. Paul	3	3				1						1	1							1		2	
Renville.....	1	1		1		1							1	1						1			
Rock.....	2	2			1				1											2			
St. Louis.....	1	1		1																1			
Scott.....	1	1		1																1			
Sibley.....	2	1	1	1		1														2			
Steele.....	1	1								1										1			
Owatonna	1	1								1										1			
Washington.....	1		1				1													1			
Stillwater	1		1				1													1			
Wright.....	1	1		1																1			
Yellow Medicine.....	1	1								1										1			
Totals.....	35	29	6	10	2	3	3	3	3	6	3	1	1	1	1	1	1	1	27	6	2	1	

Total by Months: January, 3; February, 1; March, 3; April, 3; May, 2; June, 2; July, 5; August, 6; September, 4; November, 4; December, 2.

Birthplace of Decedents: Minnesota, 25; Other United States, 1; Foreign, 9.

TABLE XXIII—DEATHS FROM ACCIDENTS, SUICIDES, HOMICIDES AND OTHER EXTERNAL CAUSES IN 1914

COUNTY	Sex		Age														Conjugal Cond.				
	Total	Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Not Given	Single	Married	Div. & Wid.	Not Given	
Aitkin	7	7				1			4	1	1						5	1	1		
Anoka	16	15	1				1	1	6	6	2	2					9	3	3	1	
Becker	33	28	5		3			6	5	5	4	4					17	8	4	4	
Beltrami	45	38	7		4	3		2	3	11	7	3	1			1	24	15			
Bemidji	16	15	1		1		2	2	3	4	2						9	4		3	
Benton	9	5	4		1				1	1	4	3					3	4	2		
St. Cloud	2	1	1		1				1								2	2			
Big Stone	9	5	4						2	2		1		1	1		4	5			
Blue Earth	28	22	6		1			4	1	4	4	4	4	5			10	11	6	1	
Mankato	17	14	3			1		3	1	3	1	1	1	2	2		7	4	5	1	
Brown	18	15	3		1				5	3	3	2	4	1	2	1	7	7	10	1	
New Ulm	7	5	2		1			1				1	1	1	1		2	4	1		
Carlton	22	17	5		1	2		2	5	2	6	1					13	7	1	1	
Cloquet	4	4								3	3		1				1	3			
Carver	11	10	1		1		1		1	2	2		3	1			5	4	2		
Cass	16	12	4		1		1	3	4	2	4				1		6	9		1	
Chippewa	11	9	2				1	1	2	4	1		1	1	1		7	1	2	1	
Chisago	11	8	3				1	1	2	5	2	2	2	2	2		5	4	2		
Clay	25	21	4				4	2	5	2	5	3	1	2	1		14	6	2	3	
Clearwater	8	8				1		2	2	2	1	1					6	1		1	
Cook	1	1				1											1				
Cottonwood	11	7	4		2	1		2	1		2	2			1		7	2	2		
Crow Wing	23	15	8		2	2	2	2	6	3	1		1	3	1		15	5	3		
Brainerd	11	6	5		2			1	1	1	1	1	1	1	1		8	1	2		
Dakota	35	27	8		1	1	1	4	10	8	2	4	1	3			22	8	4	1	
Dodge	6	6			1	1		1	1	1			1	2			3	2	1		
Douglas	14	13	1			1	1	4	3	2	2	2	1		1		9	5			
Faribault	6	6					1	1	1	1	1	2	2	1			3	2		1	
Fillmore	20	14	6		2		1	3	2	1	3	2	1	3	2		8	7	5		
Freeborn	10	8	2		1			4	1		1	2	1		1		4	5	1		
Albert Lea	4	4						2	2		1	1	1				3	1			
Goodhue	19	15	4		2			1	4	4	2	2	3	1			4	9	4	2	
Red Wing	7	6	1		1			1	2		2	1					3	2	1	1	
Grant	6	3	3			2				1	1		1				4		2		
Hennepin	387	291	96		7	8	16	15	24	87	58	65	50	23	19	13	2	174	152	35	26
Minneapolis	350	262	88		7	8	13	12	19	79	54	59	48	21	16	12	2	154	143	30	23
Houston	3	3							2					1				2	1		
Hubbard	7	6	1					1	2	1	1	1	1	1			3	2			
Isanti	11	10	1		1	1	1		1	1	2	1	2	1			6	4	1		
Itasca	36	30	6		1	1		5	7	9	6	4	1	1		1	19	12	2	3	
Jackson	7	5	2			2			3	1				1			5	2			
Kanabec	5	3	2			1	1	2							1		4		1		
Kandiyohi	7	5	2					2	1	1	1	2					2	1	3	1	
Kittson	9	7	2			2	1	1	1	1	2	1	1				5	3	1		
Koochiching	30	29	1		2	2		1	3	9	6	5	2				20	8		2	
Lac qui Parle	11	10	1		1	1	1		2	1	3	1		1			5	4	1	1	
Lake	16	15	1				1	3	8	1		3					10	4		2	
Le Sueur	21	17	4			1		1	7	2	2	5		1	2		9	8	2	2	
Lincoln	9	4	5					5	2				1	1			6	1	2		
Lyon	12	10	2		1	2		1	2		3	1	1	1			6	3	2	1	
McLeod	12	10	2			1	1		3	2		2	1	1			5	5	1	1	
Mahnomen	2	2				1			1								2				
Marshall	10	7	3				1		2	3	2	1		1			6	3	1		
Martin	15	12	3		1			1	4	2	3		2	2			5	8	2		
Meeker	13	8	5		1	1		1	1		4		3	1		1	4	8	1		
Mille Lacs	9	6	3			1		3				3	1				4	5			
Morrison	16	13	3			2		2	3	3	1	2	1	2			9	4	2	1	
Little Falls	8	7	1			1		1	1	1			1	2			4	1	2	1	
Mower	19	10	9		1	1		2	3	2		6	2	2	2		10	5	4		
Austin	9	4	5		1			2	2	1			2	1			6	3			
Murray	8	7	1					1		1	1	1		4			2	4	2		
Nicollet	10	7	3					1	2		3	4					2	4	3	1	
Nobles	16	14	2				3	1	6		1	1	3		1		9	6	1		
Norman	9	8	1					2		3	1	1	1				4	4	1		
Norman	22	15	7		1			1	3	4	3	5	3		2		7	10	5		
Olmsted	12	8	4						4	4	2	4	1		1		5	4	3		
Rochester	37	29	8		3			5	4	6	2	6	6	2	1		16	15	5	1	
Otter Tail	7	5	2						2	1		2	2				1	6			
Fergus Falls	7	6	1					1	1		1				1		3	3	1		
Pennington	7	5	2				1	1	1		1	2					3	3		1	
Pine	16	14	2			2		4		2		2		2			10	2	3	1	

TABLE XXIII—DEATHS FROM ACCIDENTS, SUICIDES, HOMICIDES AND OTHER EXTERNAL CAUSES IN 1914—Continued

COUNTY	Sex		Age														Conjugal Cond.			
	Total	Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Not Given	Single	Married	Div. & Wid.	Not Given
Pipestone	5	5						2		1		1	1				3	2		
Polk	29	18	2			1	4	1	1	1	4	1	3	2			1	1		1
Crookston	7	3							1	1	1	1					1	1		1
Pope	264	216	48	2	4	9	13	30	54	50	33	27	22	7	13		132	86	31	15
Ramsey	246	201	45	2	4	9	13	27	49	48	30	25	21	7	11		120	81	30	15
St. Paul	5	3	2			1		1	1		2			1			2	2		
Red Lake	17	11	6				1	1	5	1	3	2	1	3			6	7	7	
Renville	8	4	4		1			1	1	1	2	1			2		2	4	4	2
Rice	21	14	7				1	4	4	4	4	1		3			13	5	5	3
Faribault	11	9	2					2	1	2	3	1		2			2	7	3	1
Rock	8	7	1	1	1				2		1	1	1		1		4	3	1	
Roseau	7	6	1					2		2		1	1				5	1	1	
St. Louis	270	236	34	7	5	11	9	19	74	60	38	26	16		5		152	93	15	10
Duluth	108	89	19	3		6	5	12	22	24	16	13	4		3		56	36	8	8
Eveleth	8	5	3			1			4		2				1		4	3	1	
Hibbing	14	14				1	1	1	4	2	3	2					10	4		
Virginia	19	18	1	1		1			7	5	3	2	1				11	8		
Chisholm	20	19	1		2	1			6	10	1						8	11		1
Scott	12	10	2	1	1			2	1	1	2	1			2		7	4	1	
Sherburn	7	6	1		1				1	2		2					2	1	1	3
Sibley	4	2	2							4	2			1			1	2	2	
Stearns	26	18	8		1	1		4	3	5	4	2	2	2	2		13	4	5	1
St. Cloud	7	5	2		1				1	3	1						4	2	1	
Steele	12	11	1			3	1		2	4	1		1				6	5	5	1
Owatonna	5	4	1				1		1	2	1						2	2	1	
Stevens	7	6	1	1				1	1	1	1	2	1				4	3		
Swift	6	4	2					1	2	2				1			4	2		
Todd	9	9					1	1		1		3	1	1	1		5	2	1	1
Traverse	4	4								2	1	1						3	3	
Wabasha	18	16	2				1	1	2	3	3	3	2	1	1		5	8	3	2
Wadena	6	4	2	1			1	1		2							4	1	1	
Waseca	7	6	1						1	3	1	1	1				3	3		1
Washington	22	17	5		2			4	3	2	2	1	2	3	3		12	6	3	1
Stillwater	6	5	1		1			1	1		1		1		1		4	1	1	
Watonwan	7	5	2		1			1		3		1	1				4	1		
Wilkin	16	14	2		1	1			4	5	2		2		1		7	6	1	2
Winona	30	24	6				4	4	4	3	4	4	2	3	2		14	13	2	1
Winona	23	20	3				3	3	3	2	4	3	1	3	1		10	10	2	1
Wright	22	12	10			1	1	5	3	2	3	3	1	3			9	11	2	
Yellow Medicine	8	6	2	1	2	2						1	2				5	1		2
Totals	2067	1616	421	35	56	91	84	206	412	324	266	246	154	99	90	4	1027	716	217	107

Total by Months: January, 141; February, 134; March, 126; April, 149; May, 190; June, 190; July 253; August, 186; September, 168; October, 217; November, 193; December, 118.

Deaths by Occupations: Farmer, 386; laborer, 230; domestic, 29; carpenter, 30; merchant, 34; clerk, 50; railway employee, 51; miner, 51; teamster, 44; woodsman, 69; professional, 19; mechanic, 61; mason, 22; teacher, 9; agent, 10; barkeeper, 11; hotelkeeper, 9; official, 6; painter, 16; printer, 9; dressmaker, 3; miller, 4; contractor, 50; salesman, 3; commercial traveler, 6; policeman, 13; telephone and telegraph operator, 6; miscellaneous, 89; no occupation, 747.

Birthplace of Decedents: Minnesota, 643; Other United States, 436; Foreign, 808, Not Given, 180.

TABLE XXIV—TOTAL BIRTHS REPORTED FOR 1915

	Births exclusive of Still- births	Still- births	Children born Illegiti- mate		Births exclusive of Still- births	Still- births	Children born Illegiti- mate
Aitkin.....	355	9	7	Morrison.....	645	21	12
Anoka.....	299	12	4	Mower.....	572	17	6
Becker.....	576	18	15	Murray.....	338	6	3
Beltrami.....	726	12	18	Nicollet.....	264	3	2
Benton (exclusive of) St. Cloud (part of).....	376	10	4	Nobles.....	433	7	3
Big Stone.....	32	1	1	Norman.....	333	9	1
Blue Earth (exclusive of) Mankato.....	259	10	1	Olmsted.....	578	14	16
Brown.....	427	10	5	Otter Tail.....	1,195	31	13
Carlton.....	249	10	11	Pennington.....	351	4	4
Carver.....	559	17	7	Pine.....	452	16	3
Cass.....	569	16	8	Pipestone.....	296	7	3
Chippewa.....	334	7	2	Polk.....	873	20	12
Chisago.....	322	14	6	Pope.....	331	10	1
Clay.....	423	16	5	Ramsey (exclusive of) St. Paul.....	176	3	1
Clearwater.....	288	3	3	Red Lake.....	5,292	178	272
Cook.....	525	8	12	Redwood.....	205	4	1
Cottonwood.....	199	4	2	Renville.....	492	11	6
Crow Wing.....	32	0	0	Rice.....	628	16	5
Dakota.....	401	13	2	Rice.....	479	22	6
Dodge.....	589	20	5	Rock.....	295	9	3
Douglas.....	573	22	3	Roseau.....	355	12	2
Faribault.....	222	14	3	St. Louis (exclusive of) Duluth.....	2,669	86	13
Fillmore.....	455	5	2	Virginia.....	2,096	78	58
Freeborn.....	503	9	3	Scott.....	473	17	5
Goodhue.....	556	9	3	Sherburne (exclusive of) St. Cloud (part of).....	334	2	4
Grant.....	492	7	3	Sibley.....	185	5	1
Hennepin (exclusive of) Minneapolis.....	575	19	7	Stearns (exclusive of) St. Cloud (part of).....	2	0	0
Houston.....	241	6	2	Steele.....	350	7	3
Hubbard.....	693	22	5	Stevens.....	1,105	20	7
Isanti.....	301	11	3	Swift.....	310	7	7
Itasca.....	264	6	2	Todd.....	371	10	2
Jackson.....	321	8	5	Traverse.....	230	4	2
Kanabe.....	554	16	5	Wabasha.....	380	9	1
Kandiyohi.....	415	11	7	Wadena.....	669	13	7
Kittson.....	215	1	2	Washington (exclusive of).....	192	4	2
Koochiching.....	481	12	4	Stillwater.....	397	11	6
Lac qui Parle.....	236	4	2	Watsonwan.....	301	5	5
Lake.....	275	5	4	Wilkin.....	313	10	2
Le Sueur.....	442	11	3	Winona (exclusive of) Winona.....	306	6	2
Lincoln.....	198	7	2	Wright.....	127	3	0
Lyon.....	403	11	4	Yellow Medicine.....	285	5	7
McLeod.....	274	5	2		298	6	7
Mahnomen.....	471	17	4		272	7	2
Marshall.....	458	11	2		385	18	11
Martin.....	116	4	0		630	14	6
Meeker.....	532	11	9		399	7	2
Mille Lacs.....	514	15	3				
	416	13	2				
	304	13	1				
				Total.....	55,233	1,607	1,117

TABLE XXV—DEATHS FROM ALL CAUSES BY COUNTIES IN 1915

COUNTY	Pulmonary Tuberculosis	Non-pulmonary Tuberculosis	Lobar Pneumonia	Broncho Pneumonia	Acute Bronchitis	Chronic Bronchitis	Influenza	Cancer	Diphtheria	Whooping Cough	Scarlet Fever	Measles	Typhoid Fever	Diphtheria Under Two Years	Diphtheria Two to Five Years	Polomyelitis	Epidemic Meningitis	Tetanus	Purpural Sepsis	Smallpox	Rabies	Actinomycosis	Pellagra	Leprosy	Other Epidemic Diseases	Accidents	All Other Causes	Total Deaths (Still-births excluded)	Still-births	
Aikin.....	10	2	1	4	1	1	1	7	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	96	9	
Anoka.....	9	2	10	4	3	1	1	17	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	100	163	12	
Becker.....	20	8	16	15	1	2	16	16	5	1	3	3	3	5	1	1	1	1	1	1	1	1	1	1	1	1	101	211	18	
Beltrami.....	32	4	9	17	2	2	9	9	3	1	1	1	1	11	2	1	1	1	1	1	1	1	1	1	1	1	129	255	12	
Benton.....	6	1	5	4	2	1	1	1	1	1	3	1	1	4	4	1	1	1	1	1	1	1	1	1	1	1	58	99	11	
Big Stone.....	5	3	8	3	1	1	13	13	1	1	1	1	1	4	4	1	1	1	1	1	1	1	1	1	1	1	67	114	10	
Blue Earth.....	16	2	22	13	1	3	5	32	2	2	4	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	194	322	20	
Brown.....	13	6	6	9	5	3	2	19	1	2	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	133	221	17	
Carlton.....	13	2	8	5	3	1	14	14	5	2	2	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	175	143	16	
Carver.....	15	5	4	8	2	1	1	16	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	90	158	7	
Cass.....	39	1	10	4	2	1	1	11	3	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	50	125	14	
Chippewa.....	9	5	8	4	2	1	4	11	1	1	1	10	1	1	1	1	1	1	1	2	1	1	1	1	1	1	74	138	16	
Chisago.....	9	5	2	1	1	1	1	14	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	101	159	3	
Clay.....	13	5	6	4	3	1	1	13	5	1	1	1	1	4	1	1	1	1	2	1	1	1	1	1	1	1	86	165	8	
Clearwater.....	2	1	3	1	3	1	4	4	1	1	1	1	1	3	1	1	1	1	1	1	1	1	1	1	1	1	22	44	4	
Cook.....	1	1	5	1	1	1	1	4	1	1	1	1	1	4	1	1	1	1	1	1	1	1	1	1	1	1	4	13	4	
Cottonwood.....	3	1	2	5	1	1	1	5	1	1	1	1	1	4	1	1	1	1	1	3	1	1	1	1	1	1	59	98	13	
Crow Wing.....	12	4	18	4	1	1	2	15	1	5	2	2	2	3	3	1	1	1	1	1	1	1	1	1	1	1	142	238	20	
Dakota.....	14	3	18	13	1	6	6	19	3	1	2	1	1	10	1	1	1	1	1	1	1	1	1	1	1	1	147	273	22	
Dodge.....	17	1	4	4	2	1	2	18	1	1	1	1	1	4	1	1	1	1	1	1	1	1	1	1	1	1	51	107	14	
Douglas.....	1	3	10	12	1	1	1	13	1	1	1	1	3	1	1	1	1	1	1	1	1	1	1	1	1	1	16	109	184	5
Faribault.....	8	3	9	3	1	1	4	13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	12	103	163	9
Fillmore.....	9	2	20	17	2	2	3	35	1	1	3	2	2	3	1	1	1	1	1	1	1	1	1	1	1	1	10	138	248	9
Freeborn.....	20	7	7	4	1	2	2	24	1	1	3	2	3	5	1	1	1	1	1	1	1	1	1	1	1	1	28	114	221	7
Goodhue.....	26	1	8	12	1	8	3	39	2	1	3	2	5	7	1	1	1	1	1	1	1	1	1	1	1	1	22	221	360	19
Grant.....	11	2	8	3	1	3	6	3	3	1	1	1	1	3	1	1	1	1	1	1	1	1	1	1	1	1	41	79	6	
Hennepin.....	449	95	250	197	19	13	34	307	68	18	13	13	26	110	13	2	1	5	19	1	1	1	1	1	1	384	2,312	4,349	340	
Houston.....	11	3	7	6	1	2	2	23	1	2	2	1	2	3	1	1	1	1	1	1	1	1	1	1	1	1	7	93	157	11
Hubbard.....	11	2	4	8	1	1	1	3	3	2	1	1	1	5	1	1	1	1	1	1	1	1	1	1	1	1	5	52	96	6
Isanti.....	14	3	8	9	1	1	1	11	1	4	3	1	1	3	1	1	1	1	1	1	1	1	1	1	1	1	62	170	136	8
Itasca.....	13	3	11	6	2	1	5	3	1	7	3	1	1	11	1	1	1	1	2	1	1	1	1	1	1	1	40	62	170	16
Jackson.....	16	3	7	5	2	1	1	14	3	2	1	1	1	4	1	1	1	1	1	1	1	1	1	1	1	1	7	72	127	11
Kandiyohi.....	10	9	8	4	3	1	1	11	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	33	61	61	11
Kanabec.....	7	1	1	1	1	1	1	1	1	1	1	1	1	3	1	1	1	1	1	1	1	1	1	1	1	1	21	104	182	12
Kirtson.....	12	2	10	4	1	1	4	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	8	37	76	4
Koochiching.....	4	2	10	3	1	2	1	1	1	1	1	1	5	1	1	1	1	1	1	1	1	1	1	1	1	1	38	106	5	
Lac qui Parle.....	7	4	7	1	1	1	1	9	1	1	1	2	1	8	1	1	1	1	1	1	1	1	1	1	1	1	64	119	11	

TABLE XXVI—DEATHS FROM PULMONARY TUBERCULOSIS IN 1915

COUNTY	Total	Sex		Age										Conjugal Cond.						
		Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given	
Aitkin.....	10	4	6				1		5	2	2						6	3	1	
Anoka.....	9	3	6					1	3	1	1	1	1				5	3	1	
Becker.....	20	9	11	1			1	2	4	4	4	4	3				3	7	4	
Beltrami.....	32	13	14						10	6	6	6	2	1			12	19	1	
Bemidji.....	6	3	3						2	1	2		1				1	5		
Benton.....	5	4	2		1			1	2	2							4	2		
Big Stone.....	6	4	1						1	2							4	1	1	
Blue Earth.....	16	9	7					1	3	4	3	3	1	1	2		6	9	1	1
Mankato.....	11	6	5					1	2	4	4	1	1	1	2		5	5	1	
Brown.....	13	7	6						2	2	2	2	1	1	2		3	3	1	
New Ulm.....	8	4	4						2	2	2	2					3	3		
Carlton.....	13	7	6		1			1	8	1	1	1	1	1			5	5	1	
Cloquet.....	3	1	2						2	2	2	1					1	2		
Carver.....	15	10	5					2	2	3	5	1	2				4	10	1	
Cass.....	39	25	14	1				4	14	11	6	3	3			23	14	2		
Chippewa.....	9	5	4						3	2	1	2	2	1			1	8		
Chisago.....	9	4	5	2				1	1	1	1	1					5	4		
Clay.....	13	6	7						8	3	2	3					6	7		
Clearwater.....	2		2						1					1				2		
Cook.....	1	1						1								1				
Cottonwood.....	3	2	1					1	1	1				1			1	1		
Crow Wing.....	12	8	4					1	5	1	2	2		1			6	4	2	
Brainerd.....	7	4	3					1	1	2	2	2		1			2	3	2	
Dakota.....	14	9	5					1	3	3	4	1	1	1			8	4	2	
Dodge.....	7	4	3						1	1	1	1	2	2	3		1	4	2	
Douglas.....	11	8	3						4	3	1	1	2	2			6	4	1	
Faribault.....	8	4	4						5	1	2			1			4	4	2	
Fillmore.....	9	6	3						2	4	1	1	1	1			3	4		
Freeborn.....	20	9	11					1	3	8	2	2	2	1	2	1	4	9	6	1
Albert Lea.....	10	5	5					2	2	4	1	1	1	1	1		2	4	3	1
Goodhue.....	26	14	12		1			2	5	6	5	4	1	1	1	1	8	13	5	
Red Wing.....	9	5	4						3	2	2	1	1	1			4	4	1	
Grant.....	11	5	6					2	5	1	1	1	1				5	6		
Hennepin.....	449	273	176	4	1		4	29	123	135	75	48	22	5	1	190	225	33	1	
Minneapolis.....	420	256	164	3	1	2	4	29	119	123	71	44	18	5	1	183	204	32	1	
Houston.....	11	8	3						1	4	2			4			4	5	2	
Hubbard.....	11	8	3						3	3	3	2					7	2	1	1
Isanti.....	14	8	6					4	6	1	1	2	2				9	5		
Itasca.....	13	10	3					2	3	2	2	4					4	7	1	1
Jackson.....	6	4	2						3	1	2	2					3	3		
Kanabec.....	7	4	3						1	2	2						3	3		
Kandiyohi.....	10	6	4					1	6	1	3						6	3	1	
Kittson.....	12	6	6						4	3	2	3					6	6		
Koochiching.....	4	2	2						1	3	1	1					1	3		
Lac qui Parle.....	7	3	4					2		4		1					3	3	1	
Lake.....	6	2	4	1					1	1	2	1					2	3	1	
Le Sueur.....	8	5	3	1				1	2	1	3						4	4		
Lincoln.....	2		2					1	1	1							2	2		
Lyon.....	10	2	8				1	2	2	2	2						4	4	2	
McLeod.....	6	1	5					1	1	2	5		1				3	3		
Mahnomen.....	12	5	7	1		3	1	3	3	1	1						8	3		1
Marshall.....	13	10	3					2	8	3							7	5	1	
Martin.....	6	3	3						1	1	3				1		2	4		
Meeker.....	13	7	6		1			2	5	3	1	1					9	4		
Mille Lacs.....	10	4	6			1	1		2	2	1	1	2				3	5	2	
Morrison.....	11	4	7						4	2	2	2			1		4	7		
Little Falls.....	5	1	4						3	1		1					4	1		
Mower.....	7	3	4						2	3	1			1			3	4		
Austin.....	1		1							1							1			
Murray.....	7	3	4					1	3	1							6	1		
Nicollet.....	20	13	7						5	2	6	4	2	1		16	4			
Nobles.....	4	3	1					1	1	1	1	1					1	3		
Norman.....	16	9	7	1				4	5	5				1			8	8		
Olmsted.....	13	4	9					3	3	3	3			1			5	6	2	
Rochester.....	10	4	6					2		2	3	3					4	6		
Otter Tail.....	62	35	27					4	19	18	5	10	2	4		33	26	1		2
Fergus Falls.....	31	18	13						9	12	1	6	2	1		17	12			
Pennington.....	9	4	5					1	3	3			2				6	2		
Pine.....	16	7	9					8	5	1	2						7	10		
Pipestone.....	3	1	2						1	1		1					2		1	
Polk.....	27	15	12					3	4	8	4		2			8	14	5		

TABLE XXVI—DEATHS FROM PULMONARY TUBERCULOSIS IN 1915—Continued

COUNTY	Total	Sex		Age											Conjugal Cond.				
		Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given
Crookston	7	5	2							1	3	1	2			1	4	2	
Pope	12	4	8					2	4		3	1	1	1		5	4	3	
Ramsay	253	173	80	3				18	82	66	32	32	15	5		124	102	27	
St. Paul	248	171	77	3				18	80	64	32	32	14	5		122	99	27	
Red Lake	8	3	5					2	4		1					5	2	1	
Redwood	8	4	4				1		1	3	2	1			1	3	5		
Renville	13	7	6		1			1	4	3	3					6	7		
Rice	16	8	8			1		1	10	2		2	1			10	6		
Faribault	8	3	5			1			6	1						7	1		
Rock	3	2	1					1	2							3			
Roseau	14	6	8	1					4	1	5	2	1			2	11	1	
St. Louis	180	128	52	1	2		2	21	46	48	32	14	10	3	1	100	66	14	
Chisholm	6	2	4					1	2	1	2					1	5		
Duluth	85	67	18	1				7	26	18	18	7	5	2	1	58	23	4	
Eveleth	2	2							2		2					2			
Hibbing	7	5	2					1	3	1	1	1				4	3		
Virginia	10	7	3						5	2	1	2				6	4		
Scott	6	5	1				1	1	1	3	1					3	2	1	
Sherburne	3	1	2						1	1	1					3			
Sibley	8	5	3				1	2	4	1						4	3	1	
Stearns	32	18	14				2	4	13	7	1	4	1			19	12	1	
St. Cloud	12	6	6				1	2	3	4		2				8	4		
Steele	7	4	3					1	3		1	1		1		3	3	1	
Owatonna	4	2	2						2		1			1		2	1	1	
Stevens	1	1						1	1							1			
Swift	6	2	4					1	2		2	1				3	2	1	
Todd	7	2	5					2	1	1		2	1			2	3	2	
Traverse	4	4							1	1		1	1			1	3		
Wabasha	11	5	6						2	5	2	1		1		4	4	3	
Wadena	15	6	9				1	7	2	4			1			3	12		
Waseca	6	2	4						4	2						2	4		
Washington	19	13	6					1	9	4	1	1	2	1		15	3	1	
Stillwater	7	3	4					1	4	1		1				7			
Watsonwan	7	2	5					1	1	3	1	1				2	5		
Wilkin	1	1							1		1					1			
Winona	24	17	7					2	9	4	3	3	1	1	1	9	12	3	
Winona	21	15	6					1	8	4	3	3	1	1	1	9	9	3	
Wright	17	9	8					5	6	4		1		1		8	8	1	
Yellow Medicine	4	2	2					1	2	1						3	1		
Totals	1843	1092	751	16	9	8	16	161	554	467	268	188	99	50	7	858	826	151	8

Totals by Months: January, 160; February, 140; March, 185; April, 188; May, 179; June, 166; July, 146; August, 152; September, 114; October, 128; November, 115; December, 164.

Deaths by Occupations: Farmer, 249; laborer, 160; domestic, 47; carpenter, 44; merchant, 29; clerk, 102; railway employee, 41; miner, 21; teamster, 41; teacher, 16; woodsman, 9; professional, 10; mechanic, 34; mason, 15; agent, 19; hotel keeper, 2; barkeeper, 22; official, 6; painter, 12; printer, 10; dressmaker, 15; miller, 5; contractor, and builder 44; commercial traveler, 14; telephone and telegraph operator, 13; policeman, 5; miscellaneous, 128; no occupation, 730.

Birthplace of Decedents: Minnesota, 758; Other United States, 399; Foreign, 666; Not Given, 20.

TABLE XXVII—DEATHS FROM NON-PULMONARY TUBERCULOSIS IN 1915

COUNTY	Total	Sex		Age													Conjugal Cond.			
		Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Govern	
Anoka	2	1	1		1										1		1			
Becker	8	4	4			1	1	3		1							2			
Beltrami	4	3	1		1				1			1					3		1	
Bemidji	2	1	1						1								1		1	
Benton	1	1				1											1			
Big Stone	3		3									2						3		
Blue Earth	2	2					1			1							2			
Mankato	2	2					1		1								2		4	
Brown	6	1	5	1			1			2		1	1				2	4		
New Ulm	2	1	1	1			1					1					1		1	
Carlton	2	2		1		1											2		1	
Cloquet	1	1				1											1			
Carver	5	2	3	1		1		1	1	1							3	2		
Cass	1	1					1										1			
Chippewa	5	2	3		1	1		3									5			
Clay	5	3	2		1	1				2		1					3	1	1	
Clearwater	1	1								1							1			
Cottonwood	1		1						1								1			
Crow Wing	4	3	1	1					1	1	1						3		1	
Brainerd	3	3							1	1	1						2		1	
Dakota	3	1	2		1		1			1	1						2	1		
Faribault	5	1	4				1	1	1	1	1						3	2	2	
Fillmore	3		3						3								3		2	
Fillmore	2		2							2							2			
Freeborn	7	6	1		1					2	1	1		2			1	6		
Albert Lea	2	2													1		2		2	
Goodhue	1	1												1			1		1	
Red Wing	1	1												1			1		1	
Grant	2		2					2									2		2	
Hennepin	95	50	45	10	5	9	10	12	20	13	6	7	1	2			63	25	7	
Minneapolis	92	49	43	10	5	9	10	12	20	10	6	7	1	2			63	22	7	
Houston	3	2	1						1	1		1					2	1		
Hubbard	2	1	1				1	1									2		2	
Isanti	3		3			1			1		1						2	1		
Itasca	3	2	1		2												3			
Jackson	3	1	2						1	2							1	2		
Kandiyohi	9	4	5			1		3	1	1	2	1					5	4		
Kittson	2	1	1							2							2		2	
Koochiching	2	1	1						2								1		2	
Lac qui Parle	4	3	1				1	1		1		1					2	2		
Lake	1	1								1								1		
Le Sueur	3	2	1				1	1				1					3			
Lincoln	1		1							1								1		
Lyon	1	1							1								1			
McLeod	1	1			1												1			
Mahnomen	2	2						1	1								2			
Marshall	2	1	1						1	1							2			
Martin	3	1	2	1		1				1							2	1		
Meeker	3	2	1			1		1	1								3			
Mille Lacs	5	4	1		1		1	2	1								5			
Morrison	2	2		1										1			1		1	
Little Falls	2	2		1										1			2		1	
Mower	2	2							1	1							2			
Austin	2	2							1	1							2			
Murray	2	1	1					1									2			
Nicollet	2	2							1			1					1	1		
Nobles	2	2															2			
Norman	2	1	1					1			1				1		1		1	
Olmsted	14	11	3	2				2	3	2	2	1	2				8	6		
Rockester	13	10	3	2	3			2	3	1	2	1	2				7	6		
Otter Tail	6	2	4	2				1	1	2							4	2		
Fergus Falls	2	1	1					1		1							1	1		
Pennington	1	1								1							1			
Pipestone	1	1			1												1			
Polk	7	3	4				2	1	3	1							7			
Crookston	2	1	1						1	1							2			
Pope	6	6		2				2	1								6			
Ramsey	61	36	25	6	4	6	6	10	10	6	7	4	1	1			46	12	3	
St. Paul	59	35	24	5	4	6	6	10	10	6	7	4	1				45	12	2	
Redwood	1	1							1									1		
Renville	2	1	1			1		1									2			

TABLE XXVII—DEATHS FROM NON-PULMONARY TUBERCULOSIS IN 1915—Continued

COUNTY	Total	Sex		Age											Conjugal Cond.					
		Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given	
Rice	9	3	6				2	3	1					2				1	8	1
Faribault	7	3	4				2	1	1					1				1	6	1
Rock	2	2		1		1													2	
Roseau	3	2	1	1	1				1										2	
St. Louis	45	21	24	4	4	6	7	6	10		4	2	1	1				32	10	3
Chisholm	4	3	1			1	1	1	1									3	3	
Duluth	20	7	13		2	2	1	2	6		4	2		1				10	8	2
Eveleth	3	1	2	1			2											3	3	
Hibbing	3	1	2		1				1									2	1	
Virginia	3	2	1			1	1	1	1									1	1	
Scott	2	1	1				1						1					1	1	
Sibley	2	2						1	1									2	2	
Stearns	7	2	5	1	1	1		1	2		1							4	3	
St. Cloud	3	1	2		1			1	1		1							2	1	
Steele	2	1	1				1					1						2	2	
Owatonna	2	1	1				1					1						2	2	
Stevens	2	2		1		1												2	2	
Swift	3	1	2		1				2									2	1	
Todd	3	1	2					1	1							1		2	1	
Traverse	1	1							1									1	1	
Wabasha	1		1						1									1	1	
Wadena	1	1					1											1	1	
Waseca	2	1	1	1							1							1	1	
Washington	7	3	4	1		1	2	1	1	1								4	3	
Stillwater	2	1	1			1			1									1	1	
Watonwan	2		2					1		1								2	2	
Wilkin	1		1		1													1	1	
Winona	3	3						1	1	1								2	1	
Winona	2	2						1	1									2	2	
Wright	7	2	5		1			1		4	1							4	3	
Totals	437	237	200	39	29	37	44	65	89	50	38	26	9	9	2	299	119	19		

Totals by Months: January, 36; February, 36; March, 45; April, 46; May, 48; June, 45; July, 39; August, 22; September, 23; October, 26; November, 33; December, 38.

Deaths by Occupations: Farmer, 39; laborer, 17; domestic, 3; carpenter, 2; merchant, 2; clerk, 16; railway employee, 7; miner, 1; teamster, 3; teacher, 1; woodsman, 1; professional, 1; mechanic, 2; agent, 2; official, 1; painter, 1; dressmaker, 2; miller, 1; contractor, and builder 6; telephone and telegraph operator, 1; commercial traveler, 1; miscellaneous, 22; no occupation, 305.

Birthplace of Decedents: Minnesota, 269; Other United States, 84; Foreign, 81; Not Given, 3.

TABLE XXVIII—DEATHS FROM BRONCHO PNEUMONIA IN 1915—Continued

COUNTY	Total	Sex		Age											Conjugal Cond.				
		Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given
Ramsey	122	67	55	56	11	6	5												
St. Paul	117	65	52	52	11	6	5			1	6	3	10	13	11	89	15	18	
Red Lake	1	1		1												1			
Redwood	8	3	5	3	1	1							1	2	5	2		1	
Renville	8	5	3	3			1						1	2	4	3	1		
Rice	9	5	4	2	1			1		1	1			2	1	5	1	3	
Faribault	5	2	3	1	1			1		1			1	1	4			1	
Roek	3	2	1		1							1		1	2				
Roseau	1	1		1											1				
St. Louis	109	66	43	70	12	3	4	3		3	1	5	3	3	2	95	8	6	
Chisholm	5	3	2	5											5				
Duluth	48	30	18	27	5	1	2	3		2	1	2	1	2	38	6	4		
Eveleth	6	3	3	3		1									6				
Hibbing	8	6	2	6	1							1	1		7			1	
Virginia	14	9	5	9	2					1		1		1	13			1	
Scott	4	3	1	3											1	4			
Sherburne	1		1	1											1				
Sibley	7	5	2			1						1	1	2	1	3	3		
Stearns	12	7	5	6		1	1							1	3	8	1	3	
St. Cloud	2	1	1	2											2				
Steele	12	4	8	6			1							3	2	7	2	3	
Owatonna	4	2	2	2			1							1	3			1	
Stevens	2	1	1										1		1			1	
Swift	11	7	4	3		2							3	1	2	5	3	3	
Todd	4	2	2	3											1	3		1	
Traverse	7	4	3	3										3	1	3	1	3	
Wadena	4	1	3	1	2										3			1	
Waseca	1		1										1		1	2			
Washington	6	1	5	2								1	1	1	1	2	3	1	
Stillwater	1	1		1											1				
Watowan	7	2	5	4	1			1						1		6	1		
Wilkin	5	2	3	4	1										5				
Winona	8	4	4	5	1								1	1	6	2			
Winona	6	4	2	3	1							1	1	1	4	2			
Wright	8	2	6	4			1						1	1	5	1		2	
Yellow Medicine	7	3	4	2	1			1						1	2	4	1	2	
Totals	935	504	431	429	75	47	27	11	7	13	16	34	51	108	117	624	135	175	1

Total by Months: January, 119; February, 137; March, 156; April, 108; May, 50; June, 41; July, 44; August, 19; September, 26; October, 48; November, 60; December, 127.

Deaths by Occupations: Farmer, 83; laborer, 14; domestic, 2; carpenter, 7; merchant, 7; clerk, 2; railway employe, 3; teamster, 3; teacher, 2; woodsman, 2; professional, 4; mechanic, 3; mason, 1; agent, 1; hotelkeeper, 1; official, 2; painter, 2; printer, 1; dressmaker, 1; Miller, 1; contractor and builder, 6; miscellaneous, 22; no occupation, 765.

Birthplace of Deceaseds: Minnesota, 581; Other United States, 99; Foreign, 250; Not Given, 5.

TABLE XXIX—DEATHS FROM LOBAR PNEUMONIA IN 1915

COUNTY	Sex		Age														Conjugal Cond.			
	Total	Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given	
Aitkin	1	1													1			1		
Anoka	10	7	3					2						1		5	3		1	
Becker	16	9	7		1		1	1	1	2	1		3		1	8	6	2		
Beltrami	2	4	5					1	1	1	1					4	5			
Bemidji	9	1	1						1							1	1			
Benton	5	4	1					1					2		2	1	1		3	
Big Stone	8	3	5		1						1	1	2		2	1	3		4	
Blue Earth	22	13	9		1			2		1	3	1	4	4	4	4	8		1	
Mankato	12	10	2					1	1	1	3		1	1	3	5	5		1	
Brown	6	1	5							1			1		2	2	2		4	
New Ulm	1		1										1		1		1			
Carlton	8	5	3		3	1			1		1		2		4	3	1		1	
Cloquet	2	2							1				1			1	1		1	
Carver	4	3	1					1					1		2	3			3	
Cass	10	7	3		4				1			1	1		1	7	1		2	
Chippewa	8	5	3			1					2	1	2	1	1	2	3		3	
Chisago	5	3	2					2			1		1		1	2	1		2	
Clay	6	3	3		3			2			1				5	1	1		2	
Clearwater	3	1	2							1		1			3				3	
Cook	5	2	3		1				1		1				2				2	
Cottonwood	5	2	3		2				1	1			1			3			3	
Crow Wing	18	7	11		1	2	1		2	1	2	3	1	1	10	6			2	
Brainerd	11	5	6		1				1	1	2	3	1	1	4	5	2		2	
Dakota	18	10	8		5			1	1		3		2	4	7	6	5		5	
Dodge	4	4								1		1		2		3			1	
Douglas	10	4	6					1		1	3	1	1	3	1	7	2		2	
Faribault	9	7	2					1	1	1	1	1	1	4	1	6	8		1	
Fillmore	20	10	10		2	1		1	1	1	3	1	1	6	4	5	6		7	
Freeborn	7	4	3		1			1		1		1		2		3	2		2	
Albert Lea	2	2						1					1		1	1	1		1	
Goodhue	8	5	3		1			1			1	1		3	1	2	3		3	
Red Wing	1	1								1					1					
Grant	8	5	3					1			2				2	4			2	
Hennepin	250	137	113		14	6	3	4	1	2	32	20	41	42	47	22	67	113	68	
Minneapolis	235	128	107		13	6	2	4	1	17	29	20	41	41	43	18	65	105	63	
Houston	7	2	5		1			1			1		1		3	2	3		3	
Hubbard	4	3	1							1		2				3			1	
Isanti	8	4	4					1		1	2		2	1	1	2	3		4	
Itasca	11	7	4		1			1		3	2	1	2	1	3	7	1		1	
Jackson	7	1	6		1			1		1				2		2	3		2	
Kanabe	4	1	3				1				1		1	1		2	1		1	
Kandiyohi	8	6	2		3								2	3		4	2		2	
Koochiching	10	8	2					1		1	1	5	1	1		6	6		3	
Lac qui Parle	7	2	5		1			3		2					5	2			1	
Lake	4	3	1		1			1				1	1		3	1			1	
Le Sueur	9	5	4			1		1		1			2	1	1	4	2		3	
Lincoln	2	2			1			1							2					
Lyon	4	3	1		2						1		1		2	2			3	
McLeod	4	1	3							1	1		1	1		3			1	
Mahnomen	5	2	3		1	1		1			1	1	1	1	3	5			3	
Marshall	5	4	1							1	1	1	1	1	1	4	3		3	
Martin	7	4	3		1	1		1		1	1	1			4	3			1	
Meeker	9	6	3		1			1			1	1	3		2	6			3	
Mille Lacs	4	4						1		1	1				1	1			1	
Morrison	11	5	6		1				1	1	2	3		3	3	2			1	
Little Falls	3	2	1						1			1	1		1	1				
Mower	4	1	3		2						1	1	1		3	1			1	
Austin	4	1	3		2						1	1	1		3	1				
Murray	3	2	1						1		1	1			1	3			3	
Nicollet	13	11	2					1	1		1		4	2	4	3	6		4	
Nobles	5	3	2		1						1			2	2	2	3		3	
Norman	3	3			2								1	1	2	2	1		1	
Olmsted	8	3	5							1	1	2		1	3	2			3	
Rochester	5	2	3							1	1	1	1	1	2	2			1	
Otter Tail	31	16	15		5	1	2	4	3	3	2	1	4	2	4	17	10		4	
Fergus Falls	13	9	4		1			3	3	2	1	1	2		6	4			3	
Pennington	3	2	1		1			1							2	1			3	
Pine	4	2	2		1				1		1	1			1	1			3	
Pipestone	2	2			1					1				1	1	1			1	
Polk	12	6	6		3			3		1	1			2	6	4			2	
Crookston	3	3									1	1			2	2			1	

TABLE XXIX—DEATHS FROM LOBAR PNEUMONIA IN 1915—Continued

CONUTY	Total	Sex		Age													Conjugal Cond.			
		Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given	
Pope	3	2	1											2		1		3		
Ramsey	166	94	72	11	4	2	2	7	10	22	16	27	27	28	10	52	65	48	1	
St. Paul	163	92	71	11	4	1	2	6	10	22	16	27	27	27	10	50	65	47	1	
Red Lake	1		1															1		
Redwood	8	5	3	1									1	5	1	3	4	1		
Renville	3	1	2	2										1						
Rice	25	12	13	2	2		1	3	2	1	1	3	3	4	3	14	6	5		
Faribault	11	4	7	2				3	1	1	1	1	1	1	2	6	2	3		
Rock	3	1	2		2				1							2	2	1		
Roseau	2	2						1												
St. Louis	124	90	34	19	6	6	1	9	6	20	18	21	9	4	5	65	40	16	3	
Chisholm	6	4	2	2	1	1			1	1	1				5	5	1			
Duluth	50	39	11	2		1		3	1	10	7	16	6	2	2	21	19	9	1	
Eveleth	4	3	1		1				2	1	2					2	1	1		
Hibbing	10	9	1					3	2		3	2				3	2		1	
Virginia	5	3	2			2				2		1				7	2			
Scott	3	3							1					1	1	3	3			
Sherburne	17	10	7	2					1			2	2	6	4	5	5	7		
Sibley	3	2	1									1	1	1	1	1	1	2		
Stearns	25	14	11	6	2				1	1	1	3	2	6	3	9	11	5		
St. Cloud	2	1	1												2		1	1		
Steele	9	5	4						1	1		1	6		2	5	2			
Owatonna	3	2	1											3		3				
Stevens	1	1								1							1			
Swift	4	1	3	1									1	1	1	1		3		
Todd	12	6	6			1	1					1	3	4	2		6	4		
Traverse	1	1										1				1				
Wabasha	7	4	3	2									1	3	3	1	3			
Wadena	4	3	1						1		1				1	2	1	1		
Waseca	1		1															1		
Washington	10	5	5	1						2		1	1	1	4	2	4	4		
Stillwater	2	1	1										1		1		1	1		
Watsonwan	8	5	3	1					1		1	2	1	2		4	1	3		
Wilkin	6	3	3	2		1			1		1	1	1			4	1	1		
Winona	19	10	9	2	1				2		2	3	2	4	3	5	8	6		
Winona	14	8	6	2	1				1		1	2	3	2	3	5	5	4		
Wright	13	6	7	2			1	1		1		2	1	3	2	4	5	4		
Yellow Medicine	8	3	5	4			2							1	1	6		2		
Totals	1182	676	506	136	37	23	17	59	63	113	107	152	154	196	125	423	469	280	10	

Total by Months: January, 139; February, 142; March, 161; April, 142; May, 79; June, 64; July, 34; August, 31; September, 34; October, 55; November, 75; December, 226.

Deaths by Occupations: Farmer, 180; laborer, 71; domestic, 16; carpenter, 17; merchant, 26; clerk, 20, railway employee, 13; miner, 11; teamster, 16; teacher, 2; woodsman, 12; professional, 8; mechanic, 17; mason, 5; agent, 15; hotel keeper, 8; barkeeper, 7; official, 2; painter, 10; printer, 6; dressmaker, 3; miller, 3; contractor and builder, 16; telephone and telegraph operator, 1; commercial traveler, 5; policeman, 7; miscellaneous, 47, no occupation, 638.

Birthplace of Decedents: Minnesota, 359; Other United States, 263; Foreign, 543; Not Given, 17.

TABLE XXX—DEATHS FROM ACUTE BRONCHITIS IN 1915

COUNTY	Total	Sex		Age													Conjugal Cond.			
		Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given	
Anoka	3	1	2	1										1		1	1	1		
Becker	1	1														1		1		
Beltrami	2	1	1	1			1									2		1		
Benton	2	2															1	1		
Blue Earth	1	1		1												1		1		
Brown	5	3	2		2			1						1	1		3	1	1	
New Ulm	4	3	1		2									1	1		2	1	1	
Carver	2	1	1	1											1		1	1		
Chippewa	2	2														2		2		
Chisago	3	1	1	1												1		1		
Clay	3	1	2	1									1		1		1	2		
Clearwater	3	1	2	2										1		2		1	1	
Cottonwood	1	1													1			1		
Crow Wing	1	1			1											1		1		
Brainerd	1	1			1											1		1		
Dakota	1	1		1												1		1		
Douglas	2	2		1											1		1	1		
Faribault	1		1												1		1	1		
Fillmore	2		2	1											1		1	1		
Freeborn	1		1												1		1	1		
Goodhue	1	1															1	1		
Grant	1		1												1			1		
Hennepin	19	11	8	3		1	1	1						2		3	7	5	3	
Minneapolis	14	8	6	2		1		1					1	2		3	5	6	3	
Houston	1	1													1		1			
Hubbard	1		1												1		1	1		
Isanti	1		1												1		1			
Jackson	2		2	2												2		2		
Kandiyohi	3	1	2	1											1	1	1	1		
Kittson	1		1												1		1	1		
Lac qui Parle	1		1	1												1		1		
Lake	1	1			1											1		1		
Le Sueur	3		3											1	1				3	
Lincoln	2	2												1		1		2		
Lyon	3	1	2	3													3			
Mille Lacs	1		1												1		1	1		
Morrison	2	1	1	2												2		1		
Little Falls	1		1	1												1		1		
Murray	1	1		1												1		1		
Nicollet	2		2			1										1		1		
Olmsted	2	1	1												2			2		
Rochester	1		1												1			1		
Otter Tail	1	1		1												1		1		
Pine	1		1												1		1	1		
Pope	1	1														1		1		
Ramsey	12	1	11	4											1	2	5	3	4	
St. Paul	12	1	11	4											1	2	5	3	4	
Renville	3	2	1	2											1		2	1		
Rice	1	1		1												1		1		
St. Louis	18	11	7	12	3	3											18			
Duluth	3	2	1	1	1											3		1		
Eveleth	1		1	1		1										1		1		
Hibbing	7	5	2	4	2	1										7		1		
Virginia	2	1	1	2												2		1		
Scott	3		1												1		2	1		
Sherburne	3	3		2												1	2	1		
Stearns	1	1													1		1	1		
Steele	2	2													1		1	1		
Stevens	2	1	1	2												2		1		
Todd	2	2		2												2		2		
Wabasha	3	2	1												1	1	1	3		
Waseca	3	2	1	2	1											3		1		
Washington	1	1		1												1		1		
Stillwater	1	1		1												1		1		
Watsonwan	1	1			1											1		1		
Winona	1	1													1			1		
Winona	1	1													1			1		
Wright	1	1		1												1		1		
Yellow Medicine	1		1	1												1		1		
Totals	141	69	72	55	7	7	2	2	2	2	5	11	20	28	77	28	36			

Total by Months: January, 11; February, 20; March, 17; April, 20; May, 14; June, 8; July, 3; August 1; September, 5; October, 10; November, 11; December, 21.
 Birthplace of Decedents: Minnesota, 71; Other United States, 21; Foreign, 49.

TABLE XXXI—DEATHS FROM CHRONIC BRONCHITIS IN 1915

COUNTY	Sex		Age											Conjugal Cond.					
	Total	Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given
Aitkin.....	1		1											1				1	
Anoka.....	1		1											1				1	
Becker.....	2		2											2				1	
Beltrami.....	2	1	1												1			2	
Big Stone.....	1	1												1				1	
Blue Earth.....	3	1	2											3			1	2	
Mankato.....	1	1												1				1	
Brown.....	3	2	1					1						2		1	2		
Carlton.....	1	1												1				1	
Carver.....	1	1												1				1	
Dakota.....	6	3	3						1		1	1	1	2		3	3		
Fillmore.....	2	1	1											1		2	2	2	
Freeborn.....	2	1	1											2		2	2	2	
Goodhue.....	8	6	2											3	5	1	3	4	
Red Wing.....	1	1																1	
Hennepin.....	13	5	8										2	4	7	1	3	9	
Minneapolis.....	11	4	7										2	3	6	1	1	9	
Houston.....	2	1	1											1	1		1	1	
Isanti.....	2	1	1											1				1	
Itasca.....	2	2										1		1			1	1	
Jackson.....	1		1										1					1	
Kanabec.....	1	1												1		1			
Kandiyohi.....	1		1											1				1	
Kittson.....	1	1								1						1			
Koochiching.....	2	1	1											1	1			2	
Lac qui Parle.....	2	1	1								1			1		1	1	1	
Le Sueur.....	1		1										1					1	
Lincoln.....	1		1											1				1	
Lyon.....	4	2	2				1							3		1	2	1	
McLeod.....	1	1												1		1		1	
Martin.....	1		1											1				1	
Meeker.....	1	1												1			1		
Morrison.....	1	1													1		1		
Little Falls.....	1	1												1		1		1	
Murray.....	1		1	1												1			
Nobles.....	1		1											1				1	
Olmsted.....	2	1	1						1	1						2			
Rochester.....	2	1	1						1	1						2			
Pennington.....	1	1											1			1		1	
Polk.....	1		1											1				1	
Ramsey.....	11	7	4							1	2	4	4	4		7	4	4	
St. Paul.....	11	7	4							1	2	4	4	4		7	4	4	
Red Lake.....	1		1											1		1		1	
Redwood.....	1		1											1		1		1	
Renville.....	3	1	2			1								2	1			2	
Rice.....	1	1								1					1			1	
Faribault.....	1	1								1					1			1	
Rock.....	1		1										1					1	
St. Louis.....	9	4	5		1						1			3	4	2	3	1	
Chisholm.....	1	1												1		1		1	
Hibbing.....	1	1												1				1	
Duluth.....	5	2	3											2	3		2	3	
Scott.....	2	1	1											2				2	
Sibley.....	1		1										1			1		1	
Stearns.....	3	1	2							1		1	1			2		1	
Steele.....	2	1	1											2		2		2	
Swift.....	2	2											1	1		1		1	
Wabasha.....	1	1					1								1			1	
Waseca.....	2	1	1											2		1		1	
Washington.....	4	2	2								1	2	1		2		2	2	
Stillwater.....	1	1												1				1	
Wilkin.....	1	1												1		1		1	
Winona.....	4	3	1										1	1	2	1	3		
Winona.....	3	2	1										1	1	2	1	2		
Yellow Medicine.....	1	1												1		1		1	
Totals.....	125	63	62	1	1	1	3	2	4	7	14	45	47	10	50	64	1	1	

Totals by Months: January, 13; February, 12; March, 9; April, 9; May, 13; June, 9; July, 6; August, 4; September, 10; October, 11; November, 13; December, 16.

Birthplace of Deceaseds: Minnesota, 8; Other United States, 28; Foreign, 89.

TABLE XXXII—DEATHS FROM CANCER IN 1915

COUNTY	Total	Sex		Age													Conjugal Cond.				
		Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Not Given	Single	Married	Div. & Wid.	Not Given	
Aitkin.....	7	1	6											4	2	1			3	4	
Anoka.....	17	10	7								2	3	3	7	4	1		1	10	6	5
Becker.....	16	7	9						1	3	2	2	2	2	3			1	7	5	1
Beltrami.....	9	4	5					2		3			1				1	1	10	1	1
Bemidji.....	7	3	4					2		2							1	5	6	1	1
Benton.....	7	4	3										4	2	1			5	1	1	1
Big Stone.....	13	9	4							3	3	2	2	2	6			2	10	1	1
Blue Earth.....	32	15	17							2	2	2	2	2	7	9	3	2	19	11	11
Mankato.....	20	8	12						2	2	6	6	3	4	3	3		2	13	7	4
Brown.....	19	12	7							2	2	3	3	4	3			11	4	4	1
New Ulm.....	10	5	5							1	1	2	2	3	2	1		8	1	1	1
Carlton.....	14	6	8								9	2	3	3	3		1	8	1	3	1
Cloquet.....	2		2								1	1	1					2	2		
Carver.....	16	8	8					1		4			3	5	3		1	9	6		6
Cass.....	3	1	2						1		1	1	1	1	3			3	3		2
Chippewa.....	11	6	5							3	3	3	4	4	2		1	6	6		2
Chisago.....	14	10	4							1	2	2	2	2	1		2	6	6		6
Clay.....	13	10	3	1						1	1	1	5	3	1		3	5	5		5
Clearwater.....	4	2	2								2	1	1	1	3			4	4		4
Cottonwood.....	5	4	1							1	1	1	1	2				5	5		5
Crow Wing.....	15	10	5							1	1	4	5	4	4		1	8	6		6
Brainerd.....	12	8	4							3	3	5	5	3	3		1	6	6		6
Dakota.....	19	12	7	1				3		3	2	2	5	3	3	2		7	9		3
Dodge.....	18	7	11						2	3	4	1	4	4	4		6	8		4	4
Douglas.....	13	8	5							1	1	1	3	6	2			9	4		4
Faribault.....	15	7	8				1		1	3	1	1	3	5	1		1	6	8		8
Fillmore.....	35	20	15				1			5	7	11	10	1	1		5	22	8		8
Freeborn.....	24	14	10				1			3	6	3	6	4	4		4	12	8		8
Albert Lea.....	9	4	5							1	3	2	1	2	2		2	3		4	4
Goodhue.....	39	20	19				1		1	2	4	12	10	7	2		7	19	13		13
Red Wing.....	17	8	9				1			1	2	6	5	2			3	6	8		8
Grant.....	6	2	4							1	1	1	2	3	3			2	4		4
Hennepin.....	307	144	163			1		2	5	22	47	100	70	41	19		31	193	83		83
Minneapolis.....	290	139	151			1		1	5	22	44	97	67	36	17		30	183	77		77
Houston.....	23	12	11					1		2	2	2	7	9	2		1	15		7	7
Hubbard.....	3	1	2							1	1	1	1	1				3			3
Isanti.....	11	2	9							3	3	3	1	2	2			1	7		3
Itasca.....	3	3								2	1	1	1				1	1		1	1
Jackson.....	14	7	7					2	1	2	2	2	3	3	1		2	10		2	2
Kanabec.....	3	1	2							1	1	1	1	2	2			2		1	1
Kandiyohi.....	11	7	4								2	2	2	8				8		3	3
Kittson.....	5	2	3							2	2	1	1				1	4			
Koochiching.....	7	4	3					1	3		1	1	1	1			2	4			1
Lac qui Parle.....	9	3	6					1		1	2	2	2	1			1	5		3	3
Lake.....	2	1	1							1	1	1	1	1				2			2
Le Sueur.....	22	8	14						1	5	4	5	5	2			4	8	10		10
Lincoln.....	4	3	1							1	1	1	2	2			1	2		1	1
Lyon.....	12	8	4							1	2	5	2	2			1	5		6	6
McLeod.....	19	8	11					1			2	8	6	2			2	10		7	7
Mahnomen.....	1		1						1												
Marshall.....	12	7	5							3	2	3	3	1			2	6		4	4
Martin.....	10	6	4								2	2	3	5				5		5	5
Meeker.....	12	6	6								3	3	6	3				6		6	6
Mille Lacs.....	10	5	5						2	1	3	1	2	1				7		3	3
Morrison.....	17	6	11					1		2	7	1	3	3			2	10		5	5
Little Falls.....	6		6							1	2	2	1	1				6			6
Mower.....	15	12	3					1		2	5	2	1	4			1	10		4	4
Austin.....	6	5	1					1		1	1	2	2	1				5		1	1
Murray.....	5	4	1								2	3	2	1				5			
Nicollet.....	11	4	7							1	2	5	3	3			1	6		4	4
Nobles.....	7	3	4			1					1	2	1	2	3			1	3		3
Norman.....	4	3	1								1	3	3					4			4
Olmsted.....	112	66	46		1	1	1		1	10	15	27	38	17	1		21	76		15	15
Rochester.....	104	61	43			1	1		1	9	15	26	37	14			19	71		14	14
Otter Tail.....	9	24	16				1		1	3	2	9	12	10	2		10	21		9	9
Fergus Falls.....	40	6	3						1	1	1	1	4	1			5	3		1	1
Pennington.....	6	2	4			1	1				1	1	1	1			2	2		2	2
Pine.....	8	4	4							1	3	1	2	1			1	5		1	1
Pipestone.....	4	2	2					1			1	1	1	6			2	1		2	2
Polk.....	24	16	8								3	8	6	1			3	16		5	1
Crookston.....	10	5	5								2	4	2	1			2	7			1

TABLE XXXII—DEATHS FROM CANCER IN 1915—Continued

COUNTY	Sex		Age													Conjugal Cond.				
	Total	Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Not Given	Single	Married	Div. & Wid.	Not Given
Pope.....	11	5	6				1		1			1	2	5	1			4	4	3
Ramsey.....	199	98	101					2	4	15	22	63	62	25	6			25	128	46
St. Paul.....	189	93	96					2	4	15	21	59	59	23	6			25	120	44
Red Lake.....	3	2	1							1				2				1	2	
Redwood.....	12	5	7							2	3	2	1	3	1			1	6	5
Renville.....	19	7	12							1		6	7	5				3	11	4
Rice.....	22	9	13					1		2	4	3	4	5	3			4	8	10
Faribault.....	6	4	2					1			3	1						1	4	1
Rock.....	6	2	4							1			2	1	1			1	3	2
Roseau.....	3		3							1		1						1	2	
St. Louis.....	97	57	40				1		2	7	29	23	23	10	2			17	54	25
Chisholm.....	3	2	1							1				1	1			1	2	1
Duluth.....	65	38	27				1		2	6	21	15	15	5				16	35	13
Eveleth.....	4	4								1	2		1					1	2	1
Hibbing.....	2	1	1								1			1				1	1	1
Virginia.....	1	1									1							1	1	
Scott.....	13	5	8									1	7	3	2			2	7	4
Sherburne.....	5	1	4										1	1	3			2	2	3
Sibley.....	11	7	4								1	2	1	1				6	5	5
Stearns.....	38	17	21					1	2	2	6	10	11	4	2			4	29	5
St. Cloud.....	12	4	8								1	3	7	4				1	8	3
Steele.....	14	5	9							1	1	1	1	4	1			1	6	7
Owatonna.....	5		5							1		1	2	1				3	2	
Stevens.....	5	3	2							1	2	2						4	1	
Swift.....	9	6	3						1	1	2	2	3					4	2	3
Todd.....	22	8	14							2	1	8	6	4	1			19	3	
Traverse.....	4	4										2	2	2				1	3	
Wabasha.....	22	10	12								4	5	6	3	4			3	11	8
Wadena.....	6	2	4								3		2	1				6		
Waseca.....	10	3	7							2	1	1	3	2	1			2	5	3
Washington.....	21	8	13			1		1			4	8	4	2	1			5	12	4
Stillwater.....	13	4	9								4	4	3	1	1			3	7	3
Watonwan.....	6	1	5						1		2		1	2				1	4	1
Wilkin.....	12	5	7						2	1	1	4	2	1				1	8	3
Winona.....	36	17	19							1	4	11	8	8	4			4	21	11
Winona.....	19	9	10							1	3	5	4	4	2			2	12	5
Wright.....	29	15	14							1	2	3	8	11	4			2	17	10
Yellow Medicine.....	8	5	3							1	1	1	2	3				1	6	1
Totals.....	1780	900	880	2	1	5	6	11	36	98	241	432	462	359	126	1	228	1070	479	3

Total by Months: January, 152; February, 143; March, 151; April, 146; May, 135; June, 143; July, 146; August, 154; September, 164; October, 155; November, 139; December, 152.

Deaths by Occupations: Farmer, 451; laborer, 67; domestic, 14; carpenter, 28; merchant, 45; clerk, 23; railway employe, 27; miner, 12; teamster, 11; teacher, 8; woodsman, 5; professional, 20; mechanic, 23; mason, 14; agent, 8; hotelkeeper, 8; barkeeper, 9; official, 9; painter, 13; printer, 1; dressmaker, 4; miller, 4; contractor and builder, 19; policeman, 6; telephone and telegraph operator, 4; commercial traveler, 7; miscellaneous, 77; no occupation, 863.

Birthplace of Decedents: Minnesota, 180; Other United States, 452; Foreign, 1,137; Not Given, 11.

TABLE XXXIII—DEATHS FROM DIARRHOEAL DISEASES UNDER 2 YEARS OF AGE 1915

COUNTY	Total	Sex		Age		COUNTY	Total	Sex		Age	
		Male	Female	Under 1 yr.	1 to 2 yr.			Male	Female	Under 1 yr.	1 to 2
Aitkin	1		1	1		Little Falls	1	1		1	
Anoka	1	1				Mower	10	5	5	8	2
Becker	5	3	2	5		Austin	6	3	3	5	1
Beltrami	11	5	6	6	5	Murray	4	3	1	3	1
Bemidji	2	2		1	1	Nicollet	3	2	1	3	
Benton	4	2	2	4		Nobles	2	2		2	
Big Stone	4	1	3	3	1	Norman	1	1		1	
Blue Earth	5	2	3	5		Olmsted	3	2	1	2	1
Mankato	1		1	1		Rochester	2	1	1	1	1
Brown	8	2	6	7	1	Otter Tail	17	11	6	14	3
New Ulm	4	1	3	3	1	Fergus Falls	1	1			1
Carlton	4	2	2	3	1	Pennington	5	1	4	5	
Cloquet	2	2		1	1	Pine	2	1	1	2	
Carver	2	1	1	1	1	Polk	15	9	6	12	3
Cass	1	1		1		Crookston	5	2	3	3	2
Chippewa	2	1	1	2		Pope	6	4	2	4	2
Chisago	7	4	3	7		Ramsey	60	41	19	54	6
Clay	4	3	1	3	1	St. Paul	60	41	19	54	6
Clearwater	3	1	2	3		Red Lake	2	1	1	1	1
Cook	1		1	1		Redwood	5	4	1	5	
Cottonwood	4	3	1	4		Renville	4	3	1	3	1
Crow Wing	3	2	1	3		Rice	5	3	2	4	1
Brainerd	2	2		2		Faribault	2	1	1	2	
Dakota	10	7	3	9	1	Rock	2	1	1	2	
Dodge	4	3	1	4		Roseau	1		1	1	
Douglas	1		1	1		St. Louis	105	63	42	87	18
Faribault	1		1	1		Chisholm	9	6	3	8	1
Fillmore	3	1	2	2	1	Duluth	38	22	16	34	4
Freeborn	5	2	3	2	3	Eveleth	5	5		5	
Albert Lea	1		1			Hibbing	13	3	10	11	2
Goodhue	7	6	1	6	1	Virginia	12	8	4	8	4
Red Wing	3	3		3		Scott	5	4	1	5	
Hennepin	110	72	38	94	16	Sherburne	1		1	1	
Minneapolis	101	66	35	85	16	Sibley	5	4	1	4	1
Hubbard	3	1	2	2		Stearns	9	8	1	8	1
Isanti	5	4	1	5		St. Cloud	4	4		4	
Itasca	13	8	3	10	1	Steele	4	2	2	3	1
Jackson	4	1	3	4		Stevens	1	1		1	
Kanabec	2		2	2		Swift	1		1	1	
Kandiyohi	3	2	1	1	2	Todd	6	4	2	5	1
Kittson	1	1		1		Wabasha	8	4	4	7	1
Koochiching	7	5	2	5	2	Wadena	3	1	2	2	1
Lac qui Parle	8	7	1	7	1	Waseca	2	1	1	2	
Lake	3	2	1	2	1	Washington	7	5	2	5	2
Le Sueur	5	4	1	4	1	Stillwater	2	2		2	
Lincoln	4	2	2	4		Watsonwan	2		2	2	
Lyon	3	2	1	2	1	Wilkin	3	2	1	1	2
McLeod	2	2		2		Winona	12	5	7	9	3
Mahnomen	3	3		2	1	Winona	10	5	5	7	3
Marshall	3	2	1	3		Wright	3	2	1	3	
Martin	3	2	1	2	1	Yellow Medicine	3	3		2	1
Meeker	8	4	4	6							
Mille Lacs	3		3	3							
Morrison	4		2	2	2						
Totals	623	381	242	522	101						

Totals by Months: January, 15; February, 55; March, 55; April, 48; May, 39; June, 38; July, 41, August, 60; September, 75; October, 55; November, 32; December, 50.

Birthplace of Decedents: Minnesota, 588; Other United States, 32, Foreign, 3.

TABLE XXXIV—DEATHS FROM DIARRHOEAL DISEASES 2 TO 5 YEARS OF AGE 1915

COUNTY	Total	Sex		COUNTY	Total	Sex	
		Male	Fe- male			Male	Fe- male
Aitkin.....	1	1		St. Paul	3		3
Anoka.....	1	1		Rice.....	1	1	
Beltrami.....	2	1	1	Faribault	1	1	
Clay.....	1		1	Roseau.....	1	1	
Dakota.....	1	1		St. Louis.....	24	17	7
Faribault.....	2	1	1	Duluth	6	3	3
Hennepin.....	13	6	7	Eyeleth.....	3	3	
Minneapolis	13	6	7	Hibbing	5	4	1
Hubbard.....	1	1		Virginia.....	3	2	1
Kittson.....	1		1	Scott.....	1		1
Koochiching.....	1	1		Steele.....	1		1
Le Sueur.....	1		1	Owatonna	1		1
Lincoln.....	1	1		Todd.....	1		1
Lyon.....	1		1	Washington.....	1		1
Mille Lacs.....	1	1		Stillwater	1		1
Otter Tail.....	1	1					
Polk.....	1	1		Totals.....	63	36	27
Ramsey.....	3		3				

Total by Months: February, 4; March, 8; May, 3; June, 3; July, 7; August, 9; September, 21; October, 5; November, 1, December, 2.

Birthplace of Deceaseds: Minnesota, 56; Other United States, 7.

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TABLE XXXV—DEATHS FROM TYPHOID FEVER IN 1915

COUNTY	Total	Sex		Age													Conjugal Cond.			
		Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given	
Anoka.....	3	1	2						1					1	1		2	1		
Becker.....	3	2	1	1					2								3	3		
Beltrami.....	1	1							1								1	1		
Bemidji.....	1	1							1								1	1		
Big Stone.....	1		1						1									1		
Blue Earth.....	1	1								1								1		
Mankato.....	1	1								1								1		
Brown.....	1		1					1									1	1		
New Ulm.....	1		1					1									1	1		
Cass.....	1	1								1							1	1		
Chippewa.....	1	1					1										1	1		
Chisago.....	1	1							1								1	1		
Clay.....	2	1	1						1			1					1	1		
Crow Wing.....	2	2							2								1	1		
Brainerd.....	2	2							2								1	1		
Dodge.....	1		1									1					2	1		
Douglas.....	3	1	2		1				1				1				2	1		
Fillmore.....	2	1	1		1				1								1	1		
Freeborn.....	3	1	2			1	1			1							2	1		
Albert Lea.....	2	1	1			1					1						1	1		
Goodhue.....	5	2	3						2	2	1						2	3		
Red Wing.....	3	1	2						2	1							2	1		
Hennepin.....	26	19	7			1	3	11	8	1			3			18	6	2		
Minneapolis.....	26	19	7			1	3	11	8				3			18	6	2		
Hubbard.....	2	2					1		1							1	1	1		
Isanti.....	1		1						1							1	1			
Itasca.....	1	1							1								1	1		
Jackson.....	1		1							1							1	1		
Koochiching.....	5	4	1					2			3					1	3	1		
Le Sueur.....	1	1								1							1	1		
Marshall.....	1		1				1									1	1			
Meeker.....	1	1								1						1	1			
Mille Lacs.....	1	1										1					1	1		
Morrison.....	2		2						1					1			2	1		
Little Falls.....	1		1						1								1	1		
Mower.....	1	1											1					1		
Austin.....	1	1											1					1		
Olmsted.....	1		1						1								1	1		
Otter Tail.....	5	4	1					2	1	2						2	3			
Fergus Falls.....	3	3						1	1	1						2	1			
Pennington.....	1		1						1								1	1		
Polk.....	2	2					1			1						2	1			
Crookston.....	1	1							1							1	1			
Pope.....	1	1											1				1	1		
Ramsey.....	18	11	7					8	2	4		2	2		6	12				
St. Paul.....	18	11	7					8	2	4		2	2		6	12				
Red Lake.....	2	1	1			1						1			1	1	1			
Redwood.....	1		1								1					1	1			
Rice.....	11	10	1				5	5	1						11	1				
Faribault.....	11	10	1				5	5	1						11	1				
Rock.....	1	1							1							1	1			
Roseau.....	2	2					1	2	1											
St. Louis.....	17	13	4					2	8	6		1			13	3		1		
Duluth.....	10	7	3				1	4	4		1				7	2		1		
Eveleth.....	1	1						1	1						1	1				
Virginia.....	5	4	1					3	2						4	1				
Scott.....	1	1						1							1	1				
Stearns.....	5	1	4					2	2				1		4	1				
St. Cloud.....	3	3						1	1				1		2	1				
Todd.....	1	1						1							1	1				
Wabasha.....	1	1								1					1	1				
Washington.....	3	2	1					2	1						2	1				
Stillwater.....	3	2	1					2	1						2	1				
Wilkin.....	2	1	1					1							2	1				
Winona.....	4	2	2			1				1					2	2				
Winona.....	4	2	2			1				3					2	2				
Wright.....	1		1						1						1	1				
Yellow Medicine.....	2	2						1	1						2					
Totals.....	156	101	55	1	3	5	24	55	38	14	6	8	2	95	51	7	3			

Total by Months: January, 11; February, 11; March, 13; April, 17; May, 7; June, 7; July, 14; August, 13; September, 19; October, 12; November, 19; December, 13.

Deaths by Occupations: Farmer, 17; laborer, 16; domestic, 5; carpenter, 3; merchant, 2; clerk, 9; railway employe, 3; teamster, 3; teacher, 4; woodsman, 1; professional, 2; mechanic, 2; mason, 1; bar-keeper, 2; painter, 1; miller, 1; contractor and builder, 4; policeman, 1; telephone and telegraph operator, 1; miscellaneous, 14; no occupation, 64.

Birthplace of Decedents: Minnesota, 67; Other United States, 35; Foreign, 51; Not Given, 3.

TABLE XXXVI—DEATHS FROM DIPHTHERIA IN 1915

COUNTY	Sex		Age													Conjugal Cond.			
	Total	Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given
Benton.....	1		1				1									1			
Blue Earth.....	2	1	1						1	1							2		
Brown.....	1	1						1								1			
New Ulm.....	1	1						1								1			
Cass.....	1	1							1							1			
Chippewa.....	1	1		1												1			
Clay.....	5	3	2	1	1			2	1							4	1		
Cottonwood.....	1		1					1								1			
Dakota.....	3	1	2	2	1											3			
Fillmore.....	1	1		1												1			
Goodhue.....	2	1	1					1				1				1	1		
Red Wing.....	1	1						1								1			
Hennepin.....	68	41	27	13	3	20	15	4	7	1	3	2				64	4		
Minneapolis.....	63	37	26	13	3	18	14	3	6	1	3	2				59	4		
Isanti.....	1		1				1									1			
Itasca.....	1	1			1											1			
Kandiyohi.....	1	1			1											1			
La c qui Parle.....	1	1		1												1			
Lake.....	1		1				1									1			
Lyon.....	4	2	2		2			2								4			
Marshall.....	2		2					2								2			
Martin.....	2	1	1		1		1									2			
Meeker.....	4	2	2		1		3									4			
Mower.....	2	1	1		1						1					1	1		
Austin.....	2	1	1		1						1					1	1		
Nicollet.....	1		1													1			
Nobles.....	1		1					1								1			
Olmsted.....	1	1					1									1			
Otter Tail.....	3	2	1					1	1	1						2	1		
Fergus Falls.....	1		1					1								1			
Pennington.....	1	1					1									1			
Polk.....	2	1	1		1			1								2			
Ramsey.....	31	20	11	2	2	16	5	3	2		1					29	2		
St. Paul.....	31	20	11	2	2	16	5	3	2		1					29	2		
St. Louis.....	15	6	9	2		4	6	2	1							14	1		
Duluth.....	8	3	5		1	6	1									8			
Hibbing.....	2	1	1		2											2			
Scott.....	3	1	2		1		1		1							3			
Sherburne.....	2		2		1											2			
Sibley.....	3	1	2			2	1									3			
Stearns.....	9	5	4			3	5		1							9			
St. Cloud.....	1	1					1									1			
Steele.....	1	1					1									1			
Owatonna.....	1	1					1									1			
Stevens.....	1	1							1							1			
Swift.....	3	2	1			2					1					2	1		
Todd.....	2	1	1			1	1									2			
Wabasha.....	1	1			1											1			
Wadena.....	2	1	1					2								2			
Washington.....	2		2		1	1										2			
Stillwater.....	1		1		1											1			
Watonwan.....	1	1									1							1	
Wilkin.....	1	1			1											1			
Winona.....	8	5	3		2	4	2									8			
Winona.....	6	4	2		2	2	2									6			
Yellow Medicine.....	1	1									1						1		
Totals.....	200	113	87	21	14	61	50	23	17	3	7	4				184	15	1	

Total by Months: January, 27; February, 21; March, 19; April, 21; May, 5; June, 16; July, 9; August, 7; September, 17; October, 16; November, 18; December, 24.

Birthplace of Decedents: Minnesota, 155; Other United States, 33; Foreign, 12.

TABLE XXXVII-DEATHS FROM SCARLET FEVER IN 1915

COUNTY	Total	Sex		Age													Conjugal Cond.			
		Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given	
Aitkin	2	1	1			1		1									2			
Becker	1		1					1									1			
Beltrami	1		1			1											1			
Benton	3	3	1			2		1									3			
Blue Earth	4	3	1			1	1	2									4			
Mankato	4	3	1			1	1	2									4			
Carlton	2	1	1			1		1									2			
Cloquet	1		1			1		1									1			
Cass	1	1				1											1			
Chisago	1		1					1									1			
Clay	1		1				1										1			
Clearwater	1	1					1										1			
Dakota	2	1	1						2								2			
Dodge	1		1					1									1			
Freeborn	3	1	2				1										3			
Albert Lea	1		1				1										1			
Grant	1		1		1												1			
Hennepin	13	8	5	2	1	4	2	1	4							11	2			
Minneapolis	11	8	3	2		3	1	1	4							9	2			
Itasca	3	3				2	1									3				
Jackson	2	2				1		1								2				
Koochiching	1		1	1												1				
Martin	1		1			1										1				
Meeker	2	2						1		1						2				
Mille Lacs	1	1						1								1				
Morrison	4	2	2			1	1	2								3		1		
Nicollet	1	1			1											1				
Olmsted	5	1	4			1		2		1			1			3	2			
Rochester	1	1								1						1				
Otter Tail	5	2	3				2	3								5				
Pipestone	4	1	3	1				1		1			1			3	1			
Ramsey	29	17	12	1	1	8	8	7	3	1						28		1		
St. Paul	29	17	12	1	1	8	8	7	3	1						28		1		
Redwood	1	1				1										1				
Renville	2	1	1				1		1							1	1			
Rice	5	4	1		1		1	1	1							5				
St. Louis	4	2	2	1		1	2	1		1			1			4				
Duluth	2	2				1	1									2				
Hibbing	1	1														1				
Scott	2		1			1				1						1				
Stearns	13	7	6	2		4	4	2	1							13				
St. Cloud	1		1				1									1				
Steele	1		1						1							1				
Swift	1	1			1											1				
Todd	3	1	2			2			1							3				
Wabasha	1	1		1												1				
Wadena	7	2	5		1	2	2	2								7				
Washington	2	1	1			2										2				
Wilkin	2	1	1						2							2				
Winona	2		2				2									2				
Winona	1		1				1									1				
Wright	2	2				1	1									2				
Yellow Medicine	1	1				1										1				
Totals	144	77	67	9	6	38	33	38	13	4	1	2				135	7	2		

Total by Months: January, 21; February, 16; March, 18; April, 23; May, 14; June, 7; July, 4; August, 3; September, 8; October, 8; November, 12; December, 10.

Birthplace of Decedents: Minnesota, 121; Other United States, 21; Foreign, 2.

TABLE XXXVIII—DEATHS FROM WHOOPING COUGH IN 1915

COUNTY	Sex		Age									Conjugal Cond.							
	Total	Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given
Aitkin.....	1		1		1											1			
Anoka.....	1	1		1												1			
Becker.....	5	1	4	2	1	2										5			
Beltrami.....	33	1	2	3												3			
Blue Earth.....	22		2	2												2			
Brown.....	2	2		2												2			
New Ulm.....	1	1		1												1			
Carlton.....	5	1	4	2	3											5			
Cloquet.....	4	3	1	2	2											4			
Cass.....	1		1			1										1			
Chisago.....	1		1	1												1			
Clay.....	1		1	1												1			
Cook.....	1		1	1												1			
Cottonwood.....	1		1		1											1			
Crow Wing.....	5	1	4	3	2											5			
Dakota.....	1		1	1												1			
Douglas.....	1	1		1												1			
Fillmore.....	1		1	1												1			
Goodhue.....	1	1		1												1			
Hennepin.....	18	8	10	11	6	1										18			
Minneapolis.....	17	7	10	10	6	1										17			
Hubbard.....	2	1	1	1			1									2			
Isanti.....	4		4	3	1											4			
Itasca.....	7	2	5	6	1											7			
Lac qui Parle.....	1		1	1												1			
Le Sueur.....	1		1	1												1			
Lincoln.....	1	1		1												1			
McLeod.....	2	1	1	1	1											2			
Mahnomen.....	2	2		2												2			
Martin.....	2		2	2												2			
Mille Lacs.....	3	1	2	1	1	1										3			
Morrison.....	2		2	2												2			
Mower.....	1		1	1												1			
Nicollet.....	1	1		1												1			
Nobles.....	1		1	1												1			
Norman.....	1		1	1												1			
Olmsted.....	1	1		1												1			
Otter Tail.....	4	1	3	2	2											4			
Fergus Falls.....	2	1	1	1	1											2			
Pine.....	1	1		1												1			
Polk.....	1	1		1												1			
Pope.....	2	1	1	1	1											2			
Ramsey.....	16	10	6	6	6	2	2									16			
St. Paul.....	16	10	6	6	6	2	2									16			
Redwood.....	2	1	1	2												2			
Renville.....	1		1	1												1			
Rice.....	1	1		1												1			
Faribault.....	1	1		1												1			
Roseau.....	1	1		1												1			
St. Louis.....	45	26	19	27	12	3	2						1			43	2		
Duluth.....	11	7	4	6	4								1			10	1		
Eveleth.....	5	2	3	4	1											5			
Hibbing.....	8	4	4	5	2		1									8			
Virginia.....	8	6	2	2	4	2										8			
Scott.....	1		1	1												1			
Sherburne.....	1		1	1												1			
Sibley.....	4	3	1	4												4			
Stearns.....	1		1	1												1			
Steele.....	2	1	1	2												2			
Stevens.....	1	1		1												1			
Swift.....	1		1			1										1			
Todd.....	2	2		2												2			
Wabasha.....	2		2	1			1									2			
Wadena.....	1	1		1												1			
Watonwan.....	1		1	1												1			
Winona.....	1	1		1												1			
Wright.....	1	1		1												1			
Yellow Medicine.....	4	4		3			1									4			
Totals.....	180	84	96	116	45	11	6	1					1			178	2		

Total by Months: January, 11; February, 6; March, 14; April, 12; May, 16; June, 19; July, 13; August, 18; September, 16; October, 11; November, 16; December, 28.
 Birthplace of Decedents: Minnesota, 175; Other United States, 4; Foreign, 1.

TABLE XXXIX—DEATHS FROM MEASLES IN 1915

COUNTY	Total	Sex		Age													Conjugal Cond.			
		Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given	
Becker	3		3				2	1										3		
Benton	1		1							1									1	
Big Stone	1	1			1															
Blue Earth	1		1						1											
Carver	2	2			2															
Chippewa	10	5	5	3	3	1	1				1	1						3	1	1
Clay	1		1	1															1	
Dodge	1		1						1										1	
Faribault	1	1			1														1	
Fillmore	2		2							1									1	
Goodhue	2		2							1									1	
Hennepin	13	6	7	4	5	1	2	1	1	1								13		
Minneapolis	12	5	7	4	4	1	2	1										12		
Hubbard	1		1																1	
Jackson	1		1			1													1	
Koochiching	1		1		1														1	
Lac qui Parle	2	1	1	1	1													2		
Le Sueur	1	1																	1	
Lyon	2	2		1						1								2		
Marshall	2		2						1	1								2		
Meeker	2		2				1	1		1								2		
Morrison	2	2			1													2		
Nobles	1	1			1														1	
Olmsted	1		1					1											1	
Otter Tail	4	1	3	2	1					1								4		
Pennington	3	2	1	1		1	1											3		
Ramsey	14	9	5	6	4	2	2	2										14		
St. Paul	13	8	5	6	4	2	2	1										13		
Renville	2	1	1				1											2		
Rock	4	3	1	2		1		2										4		
Scott	1		1							1									1	
Sherburne	1	1							1										1	
Stearns	1		1	1															1	
St. Cloud	1		1	1															1	
Steele	1	1			1														1	
Owatonna	1	1			1														1	
Waseca	1		1		1														1	
Totals	86	42	44	25	23	10	8	11	7	1	1							81	4	1

Total by Months: January, 3; February, 14; March, 11; April, 19; May, 17; June, 9; July, 3; September, 2; November, 1; December, 7.

Birthplace of Decedents: Minnesota, 75; Other United States, 9; Foreign, 2.

TABLE XL—DEATHS FROM SMALLPOX IN 1915

COUNTY	Total	Sex		Age													Conjugal Cond.			
		Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given	
Dodge	1	1							1										1	
Lyon	1	1																	1	
Pine	1		1	1															1	
Ramsey	1		1																1	
St. Paul	1		1											1					1	
Stearns	1	1					1												1	
St. Cloud	1	1					1												1	
Totals	5	3	2	1			1	1					1	1				3	2	

Total by Months: January, 1; May, 1; August, 1; October, 1; December, 1.

Birthplace of Decedents: Minnesota, 4; Other United States, 1.

TABLE XLI—DEATHS FROM RABIES IN 1915

COUNTY	Total	Sex		Age												Conjugal Cond.						
		Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given			
Hennepin.....	1	1					1												1			
Minneapolis.....	1	1					1												1			
Totals.....	1	1				1													1			

Total by Months: June, 1.

Birthplace of Decedents: Minnesota, 1.

TABLE XLII—DEATHS FROM TETANUS IN 1915

COUNTY	Total	Sex		Age												Conjugal Cond.						
		Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given			
Aitkin.....	1	1		1															1			
Anoka.....	1	1						1											1			
Brown.....	1	1		1															1			
New Ulm.....	1	1		1															1			
Chippewa.....	1		1	1					1										1			
Cottonwood.....	3	2	1	1			1												3			
Fillmore.....	1		1						1											1		
Goodhue.....	1		1																	1		
Hennepin.....	5	5				1	1		2	1			1						5			
Minneapolis.....	5	5				1	1		2	1									5			
Houston.....	1	1											1							1		
Isanti.....	1	1											1							1		
Lyon.....	1		1										1							1		
Norman.....	1	1						1												1		
Ramsey.....	6	4	2				2			2	1			1					3	3		
St. Paul.....	6	4	2				2			1	1			1					3	3		
St. Louis.....	1	1							1											1		
Virginia.....	1	1							1											1		
Scott.....	1	1							1											1		
Waseca.....	1		1							1										1		
Washington.....	1	1			1															1		
Winona.....	1	1				1														1		
Winona.....	1	1				1														1		
Wright.....	1	1												1							1	
Totals.....	30	22	8	4	1	2	4	2	4	6	2	3	2						17	13		

Total by Months: January, 1; February, 2; March, 2; April, 2; May, 5; June, 2; July, 2; August, 5; September, 3; October, 2; November, 2; December, 2.

Birthplace of Decedents: Minnesota, 16; Other United States, 4; Foreign, 10.

TABLE XLIII—DEATHS FROM ANTERIOR POLIOMYELITIS (INFANTILE PARALYSIS) IN 1915

COUNTY	Total	Sex		Age											Conjugal Cond.				
		Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given
Beltrami	1	1			1												1		
Bemidji	1	1							1								1		
Benton	1	1															1		
Big Stone	1	1			1														
Blue Earth	1		1	1													1		
Chisago	1	1																	
Cottonwood	1	1								1							1		
Hennepin	1		1														1		
Minneapolis	2		2														2		
Lake	1		1			1											1		
Martin	1	1								1									1
Morrison	2	1	1						1	1							2		
Norman	1	1											1				1		
Olmsted	1	1			1												1		
Rochester	1	1	1		1												1		
Ramsey	1	1			1												1		
St. Paul	1	1	1		1												1		
St. Louis	1	1			1												1		
Stearns	4	2	2				1	1		1	1						4		
St. Cloud	2	1	1							1	1						2		
Wright	1	1								1							1		
Totals	21	11	10	1	5	3	1	3	5	1	1						19	2	

Total by Months: January, 1; February, 1; March, 1; April, 1; June, 3; August, 1; September, 7; October, 5; November, 1.

Birthplace of Decedents: Minnesota, 19; Other United States, 1; Foreign, 1.

TABLE XLIV—DEATHS FROM EPIDEMIC CEREBRO SPINAL MENINGITIS IN 1915

COUNTY	Total	Sex		Age											Conjugal Cond.				
		Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Div. & Wid.	Not Given
Aitkin	1		1		1												1		
Cass	2		2		1			1									2		
Faribault	1		1							1							1		
Hennepin	1		1			1											1		
Minneapolis	1		1		1												1		
Isanti	1		1			1											1		
Le Sueur	1		1		1												1		
Lyon	1	1			1												1		
Marshall	1	1						1									1		
Mower	1		1		1												1		
Norman	1		1							1							1		
Olmsted	1	1								1							1		
Rochester	1	1	1		1					1							1		
Pennington	1		1		1												1		
Pine	1	1								1							1		
Polk	1		1							1							1		
Pope	1	1				1											1		
Ramsey	5	2	3			2			1	1	1						5		
St. Paul	5	2	3		2				1	1	1						5		
St. Louis	1	1								1							1		
Stearns	4	2	2		1			2		1	1						4		
Stevens	1		1										1				1		
Todd	1	1			1												1		
Winona	2		2		1			1									2		
Winona	2		2		1			1									2		
Totals	30	11	19	8	5	2	4	1	6	3			1				25	5	

Total by Months: January, 2; February, 2; March, 4; April, 3; May, 5; June, 4; July, 3; August, 1; October, 3; November, 2; December, 1.

Birthplace of Decedents: Minnesota, 20; Other United States, 5; Foreign, 5.

TABLE XLV—DEATHS FROM PUERPERAL SEPSIS IN 1915

COUNTY	Total	Age				Conjugal Cond.			
		10 to 20	20 to 30	30 to 40	40 to 50	Single	Married	Div. & Wid.	Not Given
Blue Earth	2		1	1		1	1		
Mankato	1		1				1		
Cass	1		1				1		
Chippewa	2		1	1			2		
Clay	2		1	1			2		
Dakota	1			1			1		
Dodge	1			1			1		
Freeborn	1		1				1		
Albert Lea	1		1				1		
Goodhue	1						1		
Red Wing	1			1			1		
Hennepin	19	3	7	8	1	4	15		
Minneapolis	19	3	7	8	1	4	15		
Houston	1		1				1		
Hubbard	1		1				1		
Itasca	2			1			2		
Jackson	1		1				1		
McLeod	1		1				1		
Mahnomen	1			1			1		
Martin	4		2	2			4		
Meeker	2		1	1			1	1	
Mille Laes	1						1		
Morrison	1			1				1	
Norman	1		1				1		
Otter Tail	3		2	1			3		
Pennington	1		1				1		
Pine	1		1			1			
Pipestone	2			2			2		
Polk	3		1	1	1	1	2		
Crookston	2		1		1	1	1		
Ramsey	6		3	3			6		
St. Paul	6		3	3			6		
St. Louis	8		6	2			7	1	
Duluth	4		3	1			4		
Hibbing	1		1				1		
Sherburne	1				1		1		
Stearns	2		1	1			2		
Steele	1			1			1		
Swift	1			1			1		
Traverse	1				1		1		
Wabasha	2		1	1			2		
Waseca	1				1		1		
Washington	1			1			1		
Stillwater	1			1			1		
Watsonwan	1		2			1	1		
Wilkin	1			1			1		
Winona	2			2			2		
Winona	2			2			2		
Yellow Medicine	1			1			1		
Totals	86	3	40	38	5	8	75	3	

Total by Months: January, 10; February, 12; March, 9; April, 13; May, 8; June, 5; July, 7; August 1; September, 4; October, 4; November, 8; December, 5.

Birthplace of Decedents: Minnesota, 43; Other United States, 25; Foreign, 18.

TABLE XLVI—DEATHS FROM ACCIDENTS, SUICIDES, HOMICIDES AND OTHER EXTERNAL CAUSES IN 1915

COUNTY	Sex		Age														Conjugal Cond.				
	Total	Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Not Given	Single	Married	Div. & Wid.	Not Given	
Aitkin	8	8							1	2	3	2					2	5		1	
Anoka	8	8					2		1	1		2					3	3	1	1	
Becker	13	8	5					5	3		2	1	1	1			7	5	1		
Beltrami	32	27	5	2	2	4		1	6	4	2	2	2				16	12	1	3	
Bemidji	7	7			1				1	1	1	7					2	3		2	
Benton	5	4	1		1	1							1	2			2	3			
Big Stone	7	7					1	1	3	1		1	1				6	6			
Blue Earth	16	13	3				2	2	2	2	3	2		2			6	9	1		
Mankato	9	7	2				1	1	1	3	3	2		1			3	3			
Brown	11	11		1			1	2	2	2	1	1	1				5	5		1	
New Ulm	2	2						1	1	1							2	2			
Carlton	14	9	5	1			3	2	1	4	1			2			10	4			
Cloquet	7	4	3				2	1	1	2	2	1		1			4	3			
Carver	12	10	2	1		1	1	1	1	3		1	1	1			5	4	2	1	
Cass	14	13	1		3			3	3	4	1	1	1				10	4			
Chippewa	8	5	3				1		3	1	2	1	1				4	2	1	1	
Chisago	12	8	4		1		1	2	1	2	2	1	1	2			7	7	3		
Clay	17	15	2					1	4	2	6	3		1	1		5	2	2	3	
Clearwater	4	4		1					1					1			2	2			
Cook	4	4							2		1	1					4				
Cottonwood	5	5			1			2		1							4				
Crow Wing	30	21	9		1	3	2	7	6	6	3	2					16	13	1		
Brainerd	13	8	5		1	1	1	3	2	2	1	1					7	5	1		
Dakota	28	24	4			1	4	5	4	6	6	2	1		1		14	10	1	3	
Dodge	12	10	2		2	2		1	1	1	1	1		1	2		6	3	3		
Douglas	16	11	5		2	2		2	2	6		1	1	2			8	6	2		
Faribault	12	11	1	1	1			1		4		2		2			5	4	3		
Fillmore	10	7	3					1	1	1		1	1	1			4	4			
Freeborn	28	23	5			1		2	3	3	8	6	3	2	2		7	18	1	2	
Albert Lea	17	13	4			1		1	1	3	3	4	3	1	1		5	10	1	1	
Goodhue	22	17	5	1				1	7	2	2	3	2	1	2		8	9	3	2	
Red Wing	2	2							1			1					1	1			
Grant	3	2	1					1		1				1			1	1			
Hennepin	334	302	82	5	11	12	7	19	56	79	65	53	32	23	20	2	143	158	54	29	
Minneapolis	347	273	74	5	11	11	7	14	56	76	59	50	29	17	2	2	125	144	51	17	
Houston	7	7						1	1		1			2	1		2	2	1		
Hubbard	5	3	2				1	2				1		1			3	1			
Isanti	9	8	1			1	1	1		2		1	2				5	3	1		
Itasca	40	36	4		4	1	1	3	5	9	9	4	2	1	1		19	15	3	3	
Jackson	7	5	2		1			1		3		2					4	2	1		
Kanabec	7	5	2	1		1		1	1					1	2		3	2			
Kandiyohi	21	17	4	1	1	2	2	1	4	4	2	2		2	2		12	7	2		
Kittson	8	7	1					1	2	1	1	1	1				4	1	2	1	
Koochiching	24	17	7	3	1	1		2	4	5	3	2	2	1	1		13	7	1	3	
Lac qui Parle	6	5	1		1			1	2		1	1					3	3			
Lake	9	9							4	3	1	1					6	3			
Le Sueur	15	13	2		1	1	1	4	1	1	2	1	1		2		7	6	2		
Lincoln	5	4	1	1				1	1					2			1	4			
Lyon	12	9	3		1	1	2	2	1	2		3					7	4	1		
McLeod	11	7	4		1	1	1	1	1	1	2	1		2			4	5	2		
Mahnomen	4	2	2				1	2									3	3	1		
Marshall	16	14	2		1		1	1	1	3	5	2	2		1		9	7			
Martin	12	10	2			2		1	4	1	2	2					9	2		1	
Meeker	10	6	4			1		1	1	2		3		2			5	4	1		
Mille Lacs	10	7	3				2		1	1		4		1	1		2	5	3		
Morrison	22	17	5	1	2		1	5	5	1	2	1	1	3			17	2	2	1	
Little Falls	12	10	2		2		1	1	3	2	2	1	1	2			8	1	2	1	
Mower	12	11	1					1	3	2	3	1	1	1			6	4	2		
Austin	3	3						1	1			1	1				1	1			
Murray	8	6	2		1	1	1	1	1		2	1	1	1			5	2	1		
Nicollet	14	9	5	1		1	1	1	2	2	3	3					9	4		1	
Nobles	10	9	1	1				2	1	2		4	1				3	6	1		
Norman	11	11						5	1	2	1	1	1				7	3	1		
Olmsted	28	26	2		2	1		2	5	4	4	4	3	3			13	11	2	2	
Rochester	18	18							3	4	4	3	3	1			7	8	1	2	
Otter Tail	30	25	5	1			1	3	3	9	3	2	2	4	2		13	14	2	1	
Fergus Falls	8	5	3					1	1	3	2	1	1	1			5	2	1		
Pennington	5	5							2	2		1	1	1			1	1	2		
Pine	9	9			1	1		2		2	2	1					6	2	1	1	
Pipestone	7	7					1	1	3	1	1	1					4	2		1	
Polk	27	21	6		1	2	4	3	5	2	2	3	4		1		17	8	2		

TABLE XLVI—DEATHS FROM ACCIDENTS, SUICIDES, HOMICIDES AND OTHER EXTERNAL CAUSES IN 1915—Continued

COUNTY	Total	Sex		Age													Conjugal Cond.				
		Male	Female	Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Not Given	Single	Married	Div. & Wid.	Not Given	
Crookston.....	13	10	3				2	2	2	2	1	1	2		1			7	4	2	2
Pope.....	8	7	1							1	1	2						4	2	2	
Ramsey.....	243	187	56	8	1	11	8	15	42	48	31	32	24	8	12	3	94	99	32	18	
St. Paul.....	225	173	52	8	1	9	8	12	38	46	29	29	23	8	11	3	85	94	30	16	
Red Lake.....	3	1	2						1	1			1				1	1	2		
Redwood.....	9	6	3	1				2	1	2	1	1		1			4	3	2		
Renville.....	19	14	5	2	1			3	2	6	1	1			2		10	7	4	2	
Rice.....	14	11	3				1	1	4	1	2	1	2	2			7	7	3	2	
Faribault.....	9	7	2				1		3		1	1		1			5	2	2		
Rock.....	7	5	2		1		1	1	1	1	1		1		1		4	3	3		
Roseau.....	7	5	2							4			2	1			3	3	1		
St. Louis.....	207	173	34	5	4	6	5	12	62	42	29	26	8	5	3		102	75	20	10	
Chisholm.....	5	4	1	1					1	1	1						4	1	2		
Duluth.....	76	60	16		1	3	6	22	14	11	12	3	2	2			39	21	12	4	
Eveleth.....	10	8	2		1	2			3	2	1						4	4	4		
Hibbing.....	16	15	1						7	4	3	1	1				6	10	4		
Virginia.....	12	11	1					1	4	2							7	4	1		
Scott.....	13	11	2					4	2		2	1	1	2		1	6	3	3	1	
Sherburne.....	6	4	2				1	3			1	1					4	1	3	1	
Sibley.....	4	4								3	1						1	3			
Stearns.....	34	23	11		4	1	4	4		8	4	3	3	3			14	13	7		
St. Cloud.....	11	9	2		1	1	1			3	2	1		2			4	4	3		
Steele.....	12	6	6		2				1	1	2	2		2	1	1	3	7	2		
Owatonna.....	5	4	1		1					1	1	1		1			1	3	1		
Stevens.....	4	4		1	1		1			1	1						3		1		
Swift.....	8	8		1					2		4	1					7	1	1		
Todd.....	19	17	2	1	2		1	3	1	1	4	3	2	1			9	10	1		
Traverse.....	7	5	2	1	2			1	1	1	1			1			5	1	1		
Wabasha.....	23	18	5	2		1	2	3	4	2	2	2	3		2		10	8	2	3	
Wadena.....	7	6	1		1	1		1	1	1	1						6	1			
Waseca.....	7	7				1	1	1	1		2			1			4	2	1		
Washington.....	20	19	1				4	3	7	2	2	1			1		12	6		2	
Stillwater.....	3	3							2		1						1	2			
Watsonwan.....	10	7	3			1	1	3				1		2	2		5	4	1		
Wilkin.....	11	9	2	1		1	1	3	2		1	1	1				8	2	1		
Winona.....	25	24	1		1	2		1	5	1	3	8	3	1			11	10	3	1	
Winona.....	19	18	1		1	1		1	5	1	2	4	3	1			9	8	2		
Wright.....	14	10	4		1	1	1	2	2	1		1	2	2	1		6	4	2	2	
Yellow Medicine.....	7	5	2		1	1	1			1	2						6	1			
Totals.....	1904	1532	372	45	47	82	67	170	328	325	262	242	136	100	88	12	883	712	209	100	

Total by Months: January, 114; February, 124; March, 114; April, 152; May, 152; June, 169; July, 190; August, 190; September, 189; October, 169; November, 174; December, 166.

Deaths by Occupations: Farmer, 386; laborer, 184; domestic, 24; carpenter, 51; merchant, 35; clerk, 41; railway employee, 87; miner, 45; teamster, 48; teacher, 3; woodsman, 37; professional, 8; mechanic, 33; mason, 12; agent, 21; hotelkeeper, 5; barkeeper, 21; official, 4; painter, 18; printer, 7; dressmaker, 2; miller, 6; contractor and builder, 32; commercial traveler, 4; policeman, 4; telephone and telegraph operator, 2; miscellaneous, 123; no occupation, 661.

State Board of Health
Special Report of the
Epidemic of Typhoid Fever
AT NEW ULM, MINNESOTA, 1914

Typhoid Fever Epidemic

at

New Ulm, Minnesota, 1914

INTRODUCTION.

The investigation work connected with the study and control of this epidemic was undertaken by various members of the staff of the State Board of Health. The field and laboratory investigations which demonstrated the water supply to be contaminated were made by H. A. Whittaker, and the subsequent work, which included the installation of an emergency hypochlorite plant and studies on the exact sources of the contamination, was undertaken by B. M. Mohler, under the supervision of Dr. R. H. Mullin, Director of the Laboratory Division. The epidemiological investigations which involved field and office work were conducted by Dr. W. P. Greene, under the supervision of Dr. A. J. Chesley, Director of the Division of the Epidemiology.* The engineering investigations, on which recommendations were made for correcting defects in the supply, were made by J. A. Childs, under the supervision of Mr. F. H. Bass, Director of the Engineering Division.

The first notification that typhoid fever existed in New Ulm was received by the State Board of Health on January 26, 1914. In the absence of Dr. O. J. Seifert, health officer, Herman Held, secretary of the local Board of Health, reported by telephone eight cases of typhoid fever.

Our records indicated that typhoid fever had been rare in New Ulm for five years previous to 1914. No cases or deaths had been reported in the years 1910, 1912 and 1913. In 1909, one death from typhoid fever was reported, and in 1911, three cases, two of which were fatal.

At a meeting of the Brown County Medical Society early in January, local physicians reported cases of so-called "winter cholera," but up to this time the possibility that these cases were typhoid fever had not been considered.

WATER SUPPLY.

The public water supply was investigated on October 9, 1913, and the following information secured. The supply was obtained from three drilled wells 180 feet in depth, which were located beneath the floor of the city pumping station. These wells were designated for purposes of identification as No. 1, No. 2, and No. 3. Water was pumped from the wells by means of vertical deep well pumps, No. 1 having a capacity of 250 gallons per minute, and No. 2 and No. 3 each 125 gallons per minute. The superintendent of water works stated that each pump was seated over the well and attached directly to the well casing. The water from these wells was discharged into a collecting reservoir located under the floor of the pumping station, which was stated by the superintendent to be 24 feet long, 17 feet wide, and 21 feet deep. Two high pressure pumps located in the pumping station were used to pump the water from the collecting reservoir into the distribution system and into a 1,000,000 gallon concrete storage reservoir located just outside of the city limits. One of these pumps was a triplex pump having a capacity of 350 gallons per minute, and the other a duplex pump having a capacity of 700 gallons per minute. The average daily consumption of water varied from 225,000 to 325,000 gallons, and was distributed to 699 consumers. Samples of water were collected from each of the three wells and from one point on the distribution system. (Table 1, samples 13213 to 13216, inclusive.)

*The division work of the State Board of Health has since been reorganized. (See page 113.)

The bacteriological results on Well No. 3 showed indications of contamination, while the water from Wells No. 1 and No. 2 and that on the distribution system was of good sanitary quality.

A report was sent to the city which recommended that a careful inspection be made of Well No. 3 to determine the source of contamination. No steps were taken by the city authorities to comply with these recommendations and on November 19, 1913, another investigation was made and the authorities urged to take action. The results of this investigation again showed indications of contamination in the water from Well No. 3 and water of good quality from the other sources. (Table 1, samples 13299 to 13301 inclusive.) A detailed report was sent to the city which again advised a thorough examination of Well No. 3. It appears that following this second report no definite action was taken by the local authorities regarding the recommendations until the epidemic of typhoid fever occurred. On January 29 and February 3, 1914, investigations were made at the request of the local authorities, to determine the exact source of contamination. An emergency hypochlorite plant was installed at this time to treat the supply until the defects could be located and corrected. Samples of water collected on January 29 showed Wells No. 1 and No. 2 to be discharging water of good sanitary quality, but indications of contamination were found in Well No. 3 and the distribution system. (Table 1, samples 13398, 13399, 13400 and 13403.) Samples collected on February 7, while the hypochlorite treatment was being applied, showed the water on the distribution system to be free from indications of contamination. (Table 1, samples 13421 to 13425, inclusive.) During these investigations, all surface connections were removed so that actual conditions could be observed, and it was found that the information provided by the superintendent of water works at the time of the investigation of October 9, 1913, was not entirely correct. The pump heads on the wells were not attached to the well casings, and instead of one collecting reservoir under the pumping station, there were three connecting reservoirs, known locally as cisterns. (Figure 1.) The surface protection of these cisterns was found to be very unsatisfactory, and ample opportunity was afforded for their pollution. Points at which contamination could have entered as follows:

- (1) A drain leading from the pit under the feed water heater adjacent to cistern No. 3 which discharged into the soil pipe leading from the toilet at the pumping station.

- (2) Trap doors leading to Cisterns No. 1 and No. 2.

- (3) An opening in the cover leading to Cistern No. 2 through which water was actually entering.

- (4) Openings into Cisterns No. 1 and No. 2, through which waste water from the high pressure pumps was returned to the cisterns.

- (5) A drain leading from the north corner of Cistern No. 2.

All three wells were found to be improperly constructed to exclude surface pollution when the pumps were removed so that they could be properly examined. The contamination found in Well No. 3, which first caused this water supply to be suspected, probably reached the well in the following manner: This well was located inside of the wall of Cistern No. 2 with an opportunity for water to overflow the top of the casing and enter the well.

It was recommended that the hypochlorite treatment be continued until the supply was put in a satisfactory condition, that the wells be provided with adequate surface protection, and that a new collecting reservoir be constructed above ground to replace the cisterns then in use. Well No. 3 was abandoned later by the local authorities, as it did not furnish sufficient water to justify operation. The work has since been completed and the hypochlorite treatment of the water discontinued. The supply was finally approved by the State Board of Health on September 24, 1916, after thorough field and analytical investigations (Table 1, samples 15305 to 15309, inclusive) had shown the supply to be safe for public consumption.

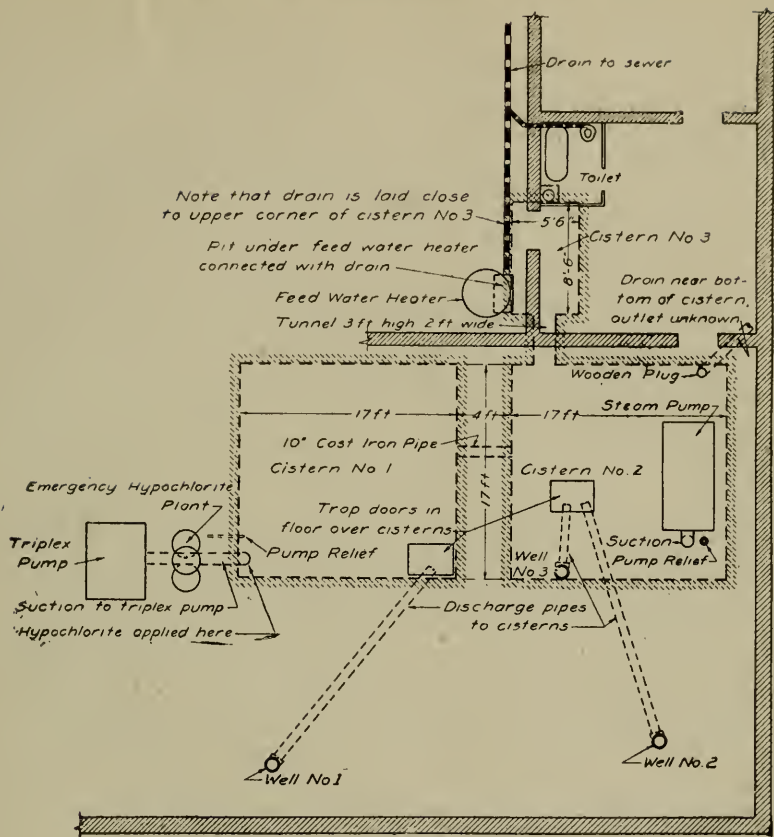


FIGURE I.
Location of wells, cisterns, pumping equipment, sewers, toilet, etc., previous to the epidemic.

TABLE I
Bacteriological Examination of Water

Sample No.	Date Collected	Source	Bacteria per cc	B. coli	
				1cc	100cc
13213	10-9-13	Well No. 1	3	0	0
13214	10-9-13	Well No. 3	125	0	+
13215	10-9-13	Well No. 3	30	0	0
13216	10-9-13	Distribution system	25	0	0
13299	11-19-13	Well No. 1	1	0	0
13300	11-19-13	Well No. 2	2	0	0
13301	11-19-13	Well No. 3	15	0	0
13398	1-29-14	Well No. 2	1	0	+
13399	1-29-14	Well No. 3	20	0	+
13400	1-29-14	Well No. 1	1	0	0
13403	1-29-14	Distribution system	13	0	+
15421	2-7-14	Distribution system	0	0	0
15422	2-7-14	Distribution system	0	0	0
15423	2-7-14	Distribution system	1	0	0
15424	2-7-14	Distribution system	0	0	0
15425	2-7-14	Distribution system	0	0	0
15305	9-25-16	Well No. 1	40	0	0
15306	9-25-16	Well No. 2	25	0	0
15307	9-25-16	Relay reservoir	15	0	0
15208	9-25-16	Distribution system	95	0	0
15209	9-25-16	Distribution system	55	0	0

0=B. coli absent.
+=B. coli present.

EPIDEMIOLOGICAL INVESTIGATION.

Dr. W. P. Greene, who did all the epidemiological field work in this epidemic, in co-operation with the local health officer, personally attended to the following:

- (1) The obtaining of histories from all frank and suspected cases of typhoid fever, together with the study of them.
- (2) The collection of blood specimens for the Widal test from all frank and suspected cases.
- (3) The inspection of all creameries, dairies, bakeries and grocery stores handling dairy products, together with the collection of data as to the original source of such products and their final distribution; and
- (4) The obtaining of data and blood specimens from all employees at the city pumping station to assist in locating a possible "carrier."

While the city water, owing to its known contamination, was from the first suspected of being the cause of the epidemic, the epidemiological study at once showed this to be a fact. The season itself eliminated flies as a possible factor. Milk and milk products could be eliminated as a factor, since the cases did not fall among the customers of any one dairyman. The cases investigated at this time, 21 in number, occurred in 17 families in persons varying from 6 to 45 years of age, most of whom were non-consumers of raw milk. The cases for the most part occurred in the best residential section of the city which was supplied with city water. With the exception of a few cases in those who worked where city water was supplied, there were no cases in the poorest and most insanitary section of the city which was not supplied with city water. Sixteen of the 21 cases drank city water exclusively, three occasionally, while two denied the use of city water.

An investigation of the condition at the pumping station showed that there was ample opportunity for pollution of the water here regardless of its source. The cisterns were beneath the floor of the pumping station and numerous holes and cracks were found where surface water could ooze into the supply. It was stated that waste water, used for washing clothes and hands, had been emptied into a hole where it might have gained access to one of the cisterns. A large force of men had been employed at the station during the month of December. Many of these men were careless in their habits and it was stated that spitting upon the floor was a general practice.

In order to ascertain if any typhoid "carriers" were present among these employees, blood specimens for the Widal test were taken from all who could be located, forty in number. Three had had typhoid fever five, fifteen and thirty-five years previously. The Widal reaction was absent in all the specimens obtained, but five employees could not be located.

A meeting of the local Health Board was called at 2 P. M., January 29, at which the Mayor, City Council, local physicians and interested citizens were present. Dr. Greene at this time discussed the situation and stated that all the evidence pointed to the water supply as the source of the infection and the following recommendations were made:

- (1) Boiling of city water used for drinking purposes, as advised by local health officer, should be continued.
- (2) Local physicians should report all suspicious cases to health officer immediately.
- (3) Competent visiting nurse should be employed to visit cases, to instruct families in necessary preventive measures and to collect data of the epidemic.
- (4) All exposed non-immunes, as far as possible, should receive anti-typhoid vaccine.

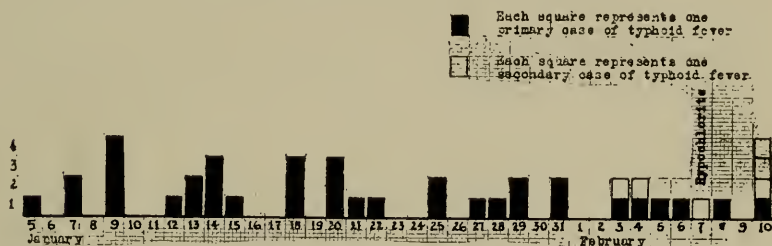
The City Council responded by promptly employing Miss Minnie Schramm, Minneapolis, as visiting nurse, and she was in their service from February 1 to February 21.

The nurse visited all families where cases or suspected cases existed and gave instructions, largely through demonstrations, concerning the disinfection of patients' discharges, of dishes used by patient, and of the hands of the nurse or care-taker. She gave baths where the conditions demanded such assistance and in other instances instructed the care-taker in this work. She also assisted the health officer in the collection of data.

In this outbreak 49 cases of typhoid fever, with three deaths, occurred between January 5 and February 10, 1914.

Forty-two of these cases occurred in New Ulm City and seven cases, which developed between January 25 and February 10, occurred in the country districts lying just outside New Ulm.

The city and country cases will be taken up separately.



The separation of these cases into primary and secondary groups has been found quite as difficult as in outbreaks of greater proportions. Thirty-six have been classed as primary and six as secondary cases.

Case 32, onset February 2, is classed as a secondary since he developed symptoms 16 days after his housemaid, and 14 days after his wife were taken sick. This family was supplied with city water.

Case 33, onset February 4, is classed as secondary since this patient developed typhoid fever while nursing her son whose first symptoms appeared 21 days previously.

Case 39, secondary, onset February 10, was a son of Case 33 and developed typhoid fever 27 days after his brother. Up to February 4 this boy's food was prepared by his mother who also acted as nurse to the primary case in the family. The family of Cases 33 and 39 was supplied with city water.

Case 37, secondary, onset on February 7, developed symptoms 33 days later than his wife, acting in the meantime as her nurse. This family was not supplied with city water. Both had used city water away from home.

Cases 41 and 42, both secondary, onset February 10, developed symptoms 23 days after the first case in the family, Case 41 acting as nurse and house-keeper meanwhile. This family was not supplied with city water. The primary case developed typhoid fever while employed in a family supplied with city water.

The apparent opportunity for food infection in Cases 32, 33 and 39, together with the occurrence of these cases late in the course of the epidemic, favor the placing of these cases as secondaries, in spite of the fact that city water was used by these cases.

Cases 37, 41 and 42 are unquestioned secondaries.

On the other hand, the following cases, classed as primaries, must be considered as doubtful:

Case 22, onset January 22, developed symptoms 15 days after the first case in the family, the mother of both patients holding the dual position of nurse and housekeeper. This family was supplied with city water.

Case 24, onset January 25, developed symptoms 16 days after his housemaid and his six-year-old daughter became sick, and ten days after his ten-year-old son. The maid was removed to the home of her parents, while the children were cared for by their mother who also prepared the meals for Case 24. City water was supplied to this household.

Case 34, onset February 4, developed first symptoms 14 days after one sister, and six days after another sister, and one brother, became sick. The earlier cases were removed to a hospital as soon as the diagnosis was established. All used city water.

Case 40, onset February 10, developed symptoms while nursing her son 11 days after the son became sick. This case was not seen by the writer and there is some doubt as to the diagnosis. One dose only of typhoid vaccine had been given eight days before first symptoms and at this time the Widal reaction was absent. With onset of illness patient had tonsillitis, soon followed by facial erysipelas. The attending physician considered the case finally as one of typhoid fever and on March 4 the Widal reaction was positive, convalescence having set in. Possibly the positive Widal reaction was due to vaccine. City water was used.

It will be seen from the above chart that 24, or two-thirds of the primary cases occurred during the first three weeks of the epidemic. The decline in the number of cases developing following the second week during which the greatest number occurred was but slight up to the rather abrupt termination of the epidemic on February 10. The incidence of cases suggests that the pollution of the water supply with typhoid bacilli, which doubtless took place some time between December 20 and 25, in all probability, continued to some extent, at least, until some time in the second or third week of the epidemic. But it is quite clear that this epidemic had become self-limited as far as primary cases are concerned before the State Board of Health was notified. This is further borne out by the results of the bacteriologic examination of the water samples taken on January 29, colon bacilli being found in 100 c.c. amounts and not in 1 c.c. amounts.

It also appears that all the secondary cases which occurred up to February 10 had been infected prior to the employment of the visiting nurse and the writer believes that her work assisted materially in the breaking off of secondary cases after February 10.

TABLE II—Showing Family Incidence of Cases in New Ulm City

No. of Cases per Family	Primary Only	Primary and Secondary			Total Families	Total Cases
		Primary 1 Secondary 1	Primary 1 Secondary 2	Primary 2 Secondary 1		
1	11	0	0	0	11	11
2	6	1	0	0	7	14
3	0	0	2	1	3	9
4	2	0	0	0	2	8
Total.....	19	1	2	1	23	42

TABLE III—Showing Age and Sex Incidence

Age	New Ulm Cases		Country Cases		Total
	Male	Female	Male	Female	
5-9.....		3			3
10-14.....	10	2	1		13
15-19.....	2	4	2		8
20-24.....	1	4			5
25-29.....	1	2	1	1	5
30-34.....	1	2			3
35-39.....	3	2			5
40-44.....	1				1
45-49.....		2			2
50-54.....	1	1		1	3
Total.....	20	22	4	2	48

COUNTRY CASES.

There were 7 cases in 3 families as follows:

TABLE IV
Country Cases

Case	Sex	Age	First Symptoms	Residence
1	F	59	Jan. 25....	Lafayette township..... Nicollet county
2	M	29	Jan. 26....	Lafayette township..... Nicollet county
3	M	19	Feb. 7....	Cottonwood township..... Brown county
4	F	26	Feb. 9....	Cottonwood township..... Brown county
5	M	14	Feb. 9....	Cottonwood township..... Brown county
6	F	16	Feb. 9....	Cottonwood township..... Brown county
7	M	16	Feb. 10....	Cottonwood township..... Brown county

Case 1 worked in the family of Case 2; Cases 3 and 7 were in a second family and Cases 4, 5 and 6 were in still another family.

All of these persons visited in New Ulm frequently. One claimed to have drunk hard cider only, but all the rest admitted drinking city water. All but one or two had eaten at some of the public eating-places while in town. While no data were collected that showed that these cases were associated with some of the city cases, Dr. Greene is inclined to believe that there may have been some such association, and that these cases were really "secondary" rather than due to city water.

During 1914, after the close of the epidemic, there occurred in New Ulm 7 cases of typhoid fever in 7 families, as follows:

TABLE V

Case	Sex	Age	First Symptoms	Source of Infection
1	M	60	May 10.....	Cases 15, 42 and 43
2	M	40	May 19.....	Unknown
3	F	36	June 16.....	Unknown
4	M	24	July 23.....	Niles, Michigan.
5	M	11	Aug. 16.....	Unknown
6	F	8	Nov. 16.....	Unknown
7	M	57	Dec. 23.....	Excelsior Springs, Ark.

Case 1 in this list, occurred in the family of Cases 15, 42 and 43. Cases 42, 43 and 15 were respectively the wife, son and daughter of Case 1; and in all probability Case 42, the housewife, was responsible for this late secondary case.

Cases 4 and 7 were distinctly imported cases.

The epidemiological data in the remaining four cases, which were very probably due to "carriers," was insufficient to fix upon the source of infection.

CONCLUSION.

This outbreak again demonstrates the apathy which frequently exists wherever local action is needed to protect the public from disease. In this case the authorities had been previously informed that the water supply was seriously polluted. It only remained for a "carrier" of typhoid bacilli to take part in such pollution and an outbreak of typhoid fever was inevitable.

Epidemiological engineering and laboratory investigations were made on this epidemic which included studies of the causes, advice regarding the protective measures necessary to control the infected persons and recommendations to correct the defects in the public water supply.

State Board of Health
SPECIAL REPORT

OF THE

Epidemic of Typhoid Fever

At Benson, Minnesota, 1914

TYPHOID FEVER EPIDEMIC AT BENSON, MINNESOTA, 1914.

INTRODUCTION.

Various members of the staff of the Minnesota State Board of Health were actively engaged in the work on this epidemic. The epidemiological work which involved the supervision of the measures of control and the collection of economic data was conducted by Dr. H. A. Burns, epidemiologist; and the diagnostic laboratory examinations were made by E. M. Wade, Chief, Main Laboratory, and Dr. O. McDaniel, Chief, Pasteur Institute, under the supervision of Dr. A. J. Chesley, Director of the Division of Preventable Diseases. The engineering and laboratory investigations on the water supply, which included the installation of an emergency hypochlorite plant, the location of the exact point of contamination of the water, and recommendations for correcting the defects in the supply, were conducted by Mr. H. A. Whittaker, Assistant Director, and Mr. J. A. Childs, Engineer, under the supervision of Dr. R. H. Mullin, Director of the Division of Sanitation.

On August 10, 1914, the Health Officer of Benson reported by letter that eight cases of typhoid fever had developed, but the source of infection had not been found.

Only two cases of typhoid fever in 1914 had been reported previous to this letter. The first, a man aged 43, a resident of Benson, fell ill December 15, 1913, fifteen days after returning from North Dakota and died January 19, 1914. The second case, a man aged 45, had first symptoms June 6, 1914. He had been traveling and while the source of infection was never positively determined the probability of infection in Benson could be excluded. In July, when the accident occurred which caused the epidemic, this man was the only known typhoid case in Benson.

Typhoid fever had been a rare disease in Benson in previous years. Records of the State Board of Health show seven cases in 1899, but these cases, like those of subsequent years, were either imported cases or local contact infections.

Two deep drilled wells supply the city with water, and water never had been shown to be the medium of typhoid infection in Benson.

The resident population numbers about 1900, but as Benson is the county seat of Swift county and has good roads radiating into a vast agricultural territory, it is an important trading center, always thronged with visitors. Hundreds of transient farm laborers stop off at Benson in July, August, and September, en route to the harvest fields of North and South Dakota and western Minnesota.

PRELIMINARY EPIDEMIOLOGICAL INVESTIGATION.

Dr. H. A. Burns took the first train to Benson and arrived there at midnight August 10. On August 11, all known and suspected cases of typhoid fever were seen with the attending physicians. Twenty-two cases were found. The Widal test was used to confirm the clinical diagnosis. The epidemiological data pointed conclusively to a waterborne infection. Anticipating difficulty in convincing Benson residents that the city water was at fault, the telephone was used to supplement the case data by questioning all families with telephones, who also had city water in their homes.

Among 92 families, no illness had occurred in July in 23, but 24 families stated that adults alone had been ill, 9 families stated that children had been ill, and 36 families reported that both adults and children had been ill.

In nine houses with private wells, 9 typhoid cases existed, but 8 patients drank city water where they worked and the ninth drank regularly large quantities of buttermilk obtained from a creamery where city water was used. It is of interest to note that later 3 employes of this creamery who used well water at home and city water at work also developed typhoid fever.

The pumping station was hastily inspected and data were obtained regarding the water supply. Visual examination showed one of the wells leaking and subject to pollution.

A heavy storm had occurred July 17 and 18, which broke a trunk sewer and it was necessary to block this sewer while undergoing repairs. This caused the sewage to back up through a drain pipe into the pump pit. The Director of the Division of Preventable Diseases was consulted by telephone at once, and a request for an emergency hypochlorite plant and the services of an engineer was made. Anti-typhoid vaccine was also requested.

WATER SUPPLY.

On August 12, 1914, the Division of Sanitation installed an emergency hypochlorite plant to treat the water and began to investigate the possible channels through which the contamination entered the supply, with the view of correcting any existing defects.

The water and light plant is located at the west end of the block bounded by Pacific avenue on the north, Kansas avenue on the south, and Fifteenth street on the west. The water supply was obtained from two drilled wells, from 160 to 167 feet in depth, which were cased with 8-inch iron pipe (Figure I). The water was pumped by the "air lift" system. A 3-inch well tube extended from the surface of the ground to a depth of about 140 feet into each well, at which point was located the lower end of the air pressure pipe. The compressed air for operating these wells was furnished by an Ingersoll-Rand 10-inch by 10-inch air compressor. The air was supplied to the wells at a pressure of from 40 to 45 pounds per square inch. With both wells operating, 140 gallons per minute could be pumped from each, while with one well operating, 150 gallons per minute could be obtained. The water rises normally to a point about 27 feet from the surface, but during operation this head is lowered about 53 feet. The water pumped from the wells was discharged into wooden boxes located directly above the wells, the bottoms of which were about one foot above the surface of the ground. The water flowed from these boxes by gravity through 4-inch wrought iron pipes to a 17,000-gallon covered concrete reservoir, located a few feet south of the pumping station. The water was drawn from this reservoir through a 6-inch suction pipe to either a duplex, double acting, steam fire pump, 18 inches by 7 inches by 10 inches stroke, or to a "Deming" vertical, triplex, motor driven pump, 5 inches by 8 inches. The water from these pumps was discharged through a 4-inch pipe into the distribution system, and into a 75,000 gallon elevated steel tank which was located near the southwest corner of the pumping station. For emergency use, a 4-inch suction pipe was connected directly to the casing of Well No. 2, at a point about 9 feet below the surface of the ground. This pipe was so arranged that water could be drawn from this well by either the triplex pump or the steam pump above described, and discharged directly into the distribution system. Both of these pumps were located in a pump pit, the floor of which was about 9 feet below the street level, the triplex pump being placed directly on the floor of the pit (Figure I). The 4-inch suction pipe from Well No. 2 lay directly on the floor of this pump pit. An abandoned 4-inch suction pipe led from Well No. 1 into the pump pit. This pipe was capped at the well end and open at the other.

The well pit surrounding Well No. 1 at the surface was approximately 10 feet in depth by 4 feet square, and was curbed with timber. A combination flange and collar connection between two sections of the well casing was located near the bottom of this pit. This connection was found to be defective. In order to prove conclusively that there was a direct connec-

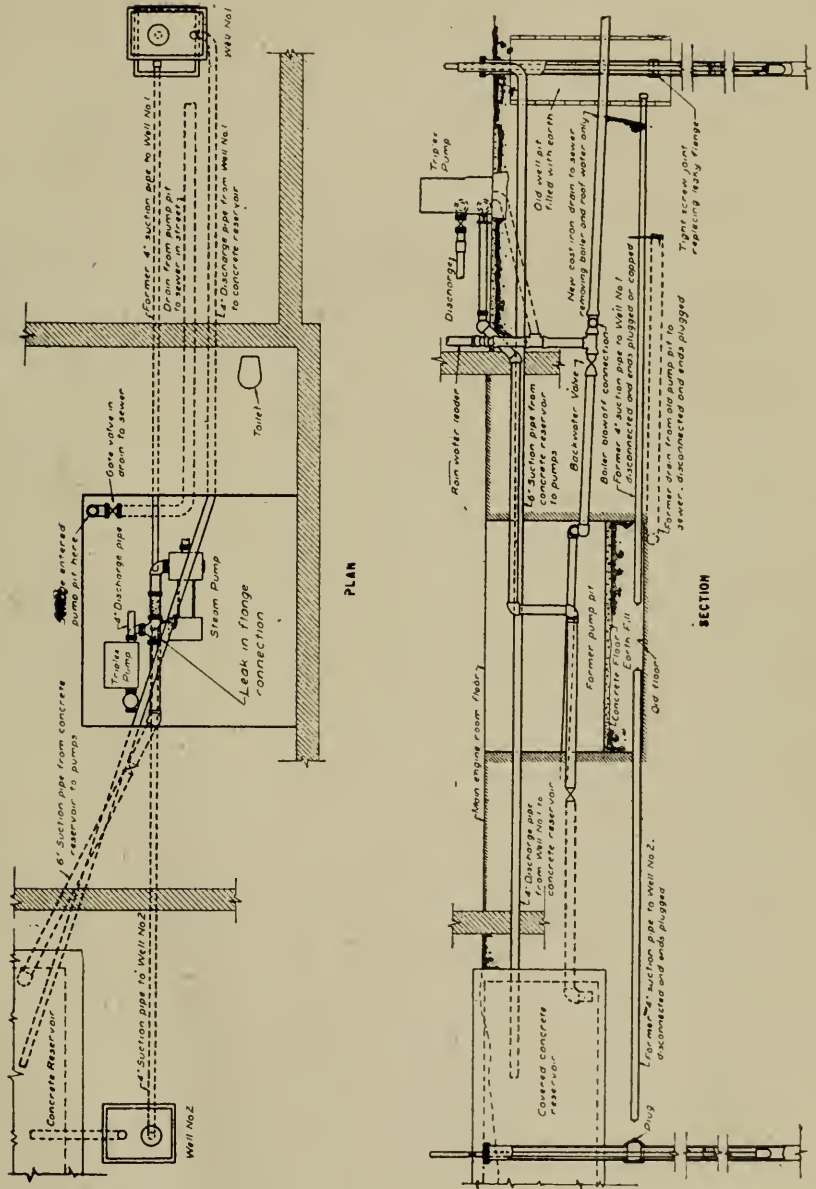


FIGURE II.

Showing condition of the water supply after the epidemic when defects had been corrected.

tion through the well casing into the well, fluorescein was mixed with the water in the well pit and water was pumped from the well until the chemical was detected in the water discharged. Indications of contamination in this well were shown by samples 13734 and 13738 (Table 1.)

The pump pit in the pumping station was drained by means of a pipe which connected with the city sewer in the center of Pacific avenue, immediately opposite the pumping station (Figure III). A gate valve on this drain pipe in the pump pit was used to close the drain and prevent water from backing up into the pump pit from the city sewers during heavy rains. (Figure I.) This drain was connected with the toilet used by the men in the water and light plant. This toilet was located between the pump pit and Well No. 1. The city sewerage system was of the combined type.

On July 17 and 18, the city sewer had been plugged for the purpose of making repairs, thus holding back the sewage and causing it to rise in the pump pit to a height of about 12 to 15 inches. The sewage covered the lower portion of the triplex pump and entirely submerged a 4-inch suction pipe connected with Well No. 1. The attendants in charge had not been notified that the sewer was being repaired and the drain pipe had not been closed. The contamination was first suspected to have entered the system at Well No. 1, on account of the leaky condition of the casing and its close proximity to the drain pipe from the pump pit. It was not until a sample of water was examined from Well No. 2 that suspicion was directed to other possible sources (Table 1, sample 13739.) On August 22, pressure tests were made on Well No. 2, which revealed the fact that a leak existed at a flange connection in the 4-inch suction pipe between Well No. 2 and the pumps (Figure I and Photo 1). The presence of the original leak must have been known to those operating the plant for the reason that this particular flange connection had been covered with concrete to a thickness of approximately three inches. The water in both of these wells stands normally at an elevation of approximately 27 feet from the surface of the ground, which is about 18 feet below this suction pipe; consequently there would be ample opportunity for water or sewage standing in the pump pit above this flange connection to enter the 4-inch suction pipe from Well No. 2 through the leaky flange, and flow directly into the well. The water between the well tube and the casing rose and fell considerably when the wells were put into operation and stopped, consequently there would be a thorough distribution of the contamination on the inside of the well.

The fact that the contamination extended into the distribution system was clearly brought out by a sample collected on August 12 (Table 1, sample 13773). The emergency hypochlorite plant (1) and the laboratory field equipment (2) used during this epidemic were of the standard types used by the Division of Sanitation. The hypochlorite plant was installed on August 12 at 10 A. M., to treat the water discharged from Well No. 2, as Well No. 1 had been discontinued by order of the Division of Preventable Diseases. The results accomplished with this plant are shown by the analyses of samples collected on the distribution system, which show the removal of contamination from the water (Table 1, samples 13735, 13736 and 13737.) Indications of contamination were still present in the untreated water from the wells at that time (samples 13738 and 13739). Samples of water collected on August 22 indicated that contamination still existed in both wells (samples 13778 and 13779) and further that practically all of this contamination had been removed from the distribution system (samples 13774 to 13777). The presence of a very slight amount of contamination, indicated in sample 13776, was probably due to the lack of thorough flushing of the distribution system, which was undertaken immediately. On the afternoon of August 22, the amount of chemical was reduced from approximately two parts per million to 0.8 of a part per million. The analytical results again showed the presence of contamination in the

(1) Railroad Water Supplies in Minnesota, U. S. Public Health Reports, May 15, 1914.

(2) Hypochlorite Treatment of Water Supplies, U. S. Public Health Reports, February 26, 1915.

water from Well No. 2, which was being treated, and the absence of contamination in all samples collected from the distribution system (samples 13780 to 13784). On comparing sample 13776 with 13782, it is seen that the contamination indicated in the distribution system on the previous date had been removed. Very careful check was kept on this hypochlorite plant during August 22, 23, and 24, and the employees in charge were carefully instructed as to the proper operation of the plant. Written instructions were left with the Water and Light Commission and a duplicate copy was placed in the hands of the employees in charge of the plant. On August 24, regular routine samples for complete laboratory examination were collected from the source, Well No. 2, and also at the regular sampling stations on the distribution system. The results of these examinations again show the presence of contamination in Well No. 2 (sample 13747), but that this contamination was removed by the hypochlorite treatment (samples 13743 to 13746).

On August 23, an attempt was made to disinfect Well No. 2, by the addition of hypochlorite solution to the well. Five barrels of a strong solution of hypochlorite were added directly to the well between the well tube and the outer casing. The analytical results showed this attempt to be unsuccessful (samples 13747 and 13785.)

The following recommendations were made to the Water and Light Commission regarding changes in the pumps and piping system in order that this water supply might be made absolutely safe from a sanitary point of view.

- (1) That the sewer leading from the pump pit in the manhole near the side walk on Pacific avenue be dug up and entirely removed.
- (2) That the old suction pipe from Well No. 1, now abandoned, be dug up and removed.
- (3) That the leak in the well casing at Well No. 1, be permanently repaired and that the well pit around Well No. 1 be filled with sand.
- (4) That the toilet be removed from its location to the west side of the pumping station and a new sewer connection made with the sewer in the center of Fifteenth street.

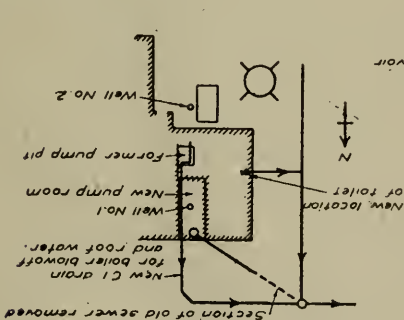


FIGURE III.

Location of drain pipe and sewers before changes were made.

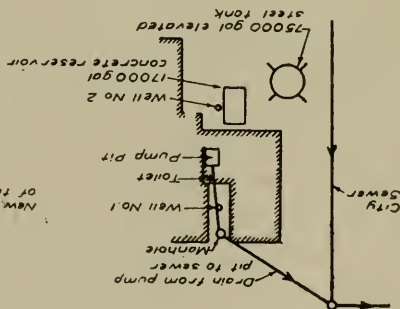


FIGURE IV.

Location of drains and sewers after connections were made.

(5) That the suction pipe from Well No. 2 be dug up, removed and the connection with the well be capped or plugged.

(6) That both pumps be removed from the present pump pit and placed at an elevation at or above the street level.

(7) That the suction pipe from the 17,000 gallon concrete reservoir to the pumps be also raised to a point just under the floor of the electrical machinery room.

TABLE I—BACTERIOLOGICAL EXAMINATION OF WATER

Sample Number	Date Collected	Source	Bacteria Per cc	B. coli		Remarks
				1 cc	100 cc	
13733	8-12-14	Distribution system, station 4*	.....	+	+	Untreated water.
13734	8-12-14	Well No. 1, station 1	.....	+	0	Untreated water.
13735	8-13-14	Distribution system, station 5	1	0	0	Treated.
13736	8-13-14	Distribution system, station 6	4	0	0	Treated.
13737	8-13-14	Distribution system, station 7	1	0	0	Treated.
13738	8-13-14	Well No. 1, station 1	220	+	+	Untreated.
13739	8-13-14	Well No. 2, station 2	26	+	+	Untreated.
13740	8-13-14	Distribution system, station 8	2	0	0	Treated.
13743	8-24-14	Distribution system, station 5	68	0	0	Treated.
13744	8-24-14	Distribution system, station 6	13	0	0	Treated.
13745	8-24-14	Distribution system, station 7	18	0	0	Treated.
13746	8-24-14	Distribution system, station 8	75	0	0	Treated.
13747	8-22-14	Well No. 2, station 2	500	+	+	Disinfection unsuccessful.
13774	8-22-14	Distribution system, station 5	.....	.....	OP	Treated.
13775	8-22-14	Distribution system, station 6	.....	.....	OP	Treated.
13776	8-22-14	Distribution system, station 7	.....	.....	+P	Treated.
13777	8-22-14	Distribution system, station 8	.....	.....	OP	Treated.
13778	8-22-14	Well No. 1, station 1	.....	.....	+P	Untreated.
13779	8-22-14	Well No. 2, station 2	.....	.....	+P	Untreated.
13780	8-23-14	Distribution system, station 5	.....	.....	OP	Treated.
13781	8-23-14	Distribution system, station 6	.....	.....	OP	Treated.
13782	8-23-14	Distribution system, station 7	.....	.....	OP	Treated.
13783	8-23-14	Distribution system, station 8	.....	.....	OP	Treated.
13784	8-23-14	Distribution system, station 8	.....	.....	OP	Treated.
13999	11-23-14	Well No. 2, station 2	65	0	0	Disinfection unsuccessful.
14000	11-23-14	Distribution system, station 5	60	0	0	Treated.
14001	11-23-14	Distribution system, station 6	350	0	0	Treated.
14002	11-23-14	Distribution system, station 7	16	0	0	Untreated.
14003	11-23-14	Well No. 1, station 1	3	0	0	Untreated.
14004	11-23-14	Well No. 2, station 2	50	0	0	Treated.
14052	12-23-14	Distribution system, station 5	80	0	0	Treated.
14053	12-23-14	Distribution system, station 6	45	0	0	Treated.
14064	12-23-14	Distribution system, station 7	39	0	0	Treated.
14065	12-23-14	Distribution system, station 8	19	0	0	Untreated.
14443	9-23-15	Wells Numbers 1 and 2, stations 1 and 2	36	0	0	Treated.
14444	9-23-15	Distribution system, station 5	31	0	0	Untreated.
14445	9-23-15	Distribution system, station 6	18	0	0	Untreated.
14446	9-23-15	Distribution system, station 7	23	0	0	Untreated.
14446	9-23-15	Distribution system, station 8	21	0	0	Untreated.

*Location of stations 1 to 8 shown on map. +B. coli present. O B. coli absent. P Presumptive test for B. coli. B Sample broken in transit.

(8) That in order to insure protection against the failure of the present air compressor that another air compressor be installed which should be driven by a steam engine.

(9) That blow-off water from the boilers could be conducted from the boilers to the sewer in Pacific avenue provided the pipe in which this water flows is constructed of iron.

(10) That the hypochlorite treatment be continued until all the above mentioned changes had been made and the supply investigated and found satisfactory by the State Board of Health.

Subsequent investigations were undertaken on this water supply on November 23, 1914, and December 23, 1914, and September 23, 1915. These investigations were made for the purpose of determining whether or not the recommendations had been satisfactorily complied with. Samples of water were collected at the source and at regular collection stations on the distribution system, as shown on the plat of the city.

The recommendations offered, or their equivalents, were carried out in each case in a satisfactory manner (Figures II and IV). The hypochlorite treatment was discontinued on December 31, 1914, on advice from the State Board of Health that the treatment was no longer necessary.

METHODS ADOPTED FOR CONTROL OF THE DISEASE.

At a meeting of the City Council August 11, evidence concerning the source and route of the infection was explained and methods of control were discussed by Dr. Burns with the local physicians and the City Council. A visiting nurse was engaged by order of the City Council at this time. During the week of August 22, public-spirited citizens induced the Council to appropriate \$600 to be used by the local Board of Health in the management and prevention of cases. Two additional nurses were employed. At this time there were 34 patients in private homes without trained nurses in attendance; 17 patients in homes had trained nurses and 26 patients were in the Benson Hospital.

The nurses' territory was divided, one caring for all cases north of the railroad tracks, another attending to all cases south of the railroad tracks. The third nurse was made responsible for the work of the two. She also assisted in the follow-up work, charting and recording of cases and suspected cases. The nurses' duties consisted of visiting families where there were no trained nurses in attendance. When making calls they gave instructions and demonstrations in the care of the sick and the protection of the well. A circular "Typhoid Fever in Benson" was distributed and explained. Fifteen to twenty cases were visited and from three to five temperature baths given by each nurse daily.

Anti-typhoid vaccination was begun on August 12, the physicians inoculating members of families where cases already existed as well as persons exposed only to water infection.

After initiating the above proceedings following the preliminary investigation, attention was given to conditions which might give rise to secondary cases.

Disposal of Sewage, Night Soil and Garbage:—About one-third of the dwelling were connected with the sewerage system. All privies were built over shallow excavations and were not fly-proof.

Stable manure was heaped up in piles outside of the barns, thereby forming breeding places for flies. Garbage was deposited in excavations 2 to 4 feet deep and more or less imperfectly covered with earth from day to day. In some instances it was allowed to accumulate in the back-yards. The garbage, therefore, afforded added breeding places for flies.

In order to remove the opportunities for secondary infections through polluted wells and the agency of flies, two men were employed to systematically treat all manure piles, privy vaults, garbage piles and excavations containing garbage, with hypochlorite of lime. This was carried out during the remainder of the fly season, such places being treated three times.

Milk Supply:—The milk supply was the most difficult problem of control connected with the epidemic. All resident farmers and retired farmers owned one or more cows and sold to neighbors as much milk as could be spared. There was no recorded information concerning the number of dairies in the city. Upon investigation, thirty-six families were found who sold milk. These dairies supplied milk to 634 persons in 213 families. Each dairy was visited. Instructions were given concerning the importance of cleanliness in the handling of milk. All milkers were directed to thoroughly cleanse hands before milking or handling milk, and anti-typhoid vaccination was urged. All families selling milk were ordered to report at once, any illness developing in the family and to cease the selling of milk until an investigation could be made by the health officer. Families where typhoid fever developed were prohibited from selling milk. Repeated visits were made to dairies to see that instructions were being carried out.

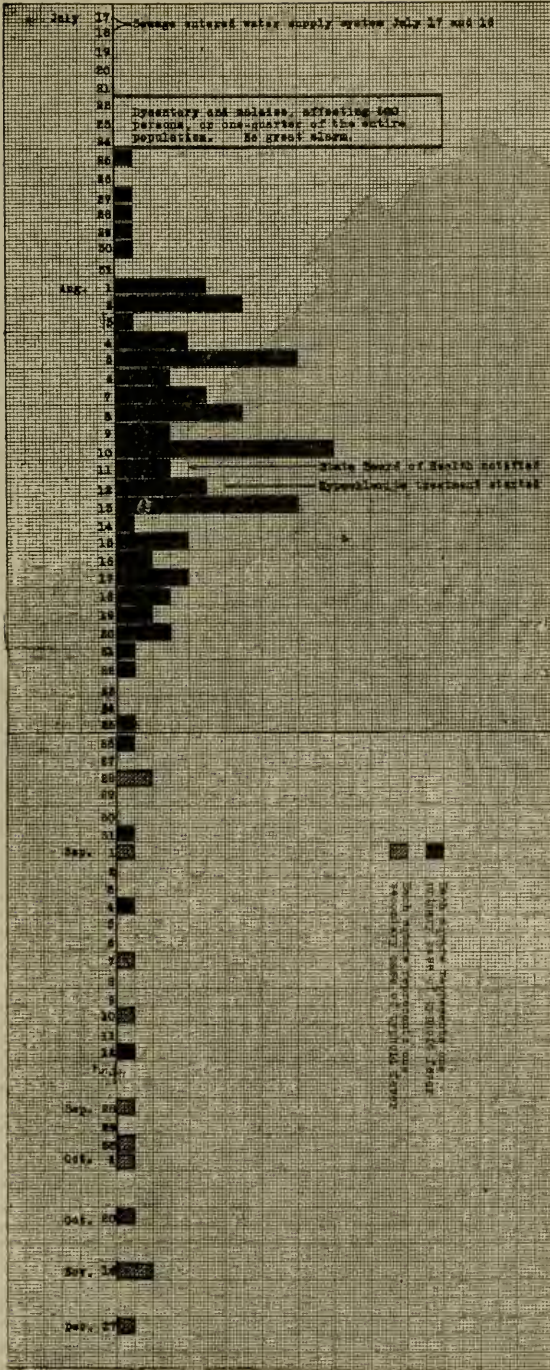
Conduct of Convalescents:—Convalescents were instructed to thoroughly wash their hands following defecation and micturition, and to disinfect their discharges for a period of at least two months after passing from under the care of the nurse and physician. It was advised that persons recovered from typhoid fever in whose blood serum the Widal reaction persisted, should not be allowed to engage in any occupation concerned with the handling of that part of the public food supply which is ready for consumption. This advice was rigidly enforced by the local authorities during the week of November 22, when a fair was held which brought to Benson 25,000 visitors.

Follow-up of Transients:—In order to cope with the migration of infected persons every effort was made to follow up all visitors to Benson between July 18 and August 12. Hotel registers were copied so as to be able to follow up commercial travelers, land buyers, tourists and all such non-resident persons temporarily exposed. Of 368 persons who registered, 221 were from Minnesota. These persons were traced and two were found to have developed typhoid fever. Data concerning persons exposed in Benson, but living outside the state, were less definite. Executive health officers of eighteen states and four Canadian provinces were written to, giving the names and dates of registration in Benson of citizens from their respective territories and requesting that if possible they be followed up and information obtained for us relative to their subsequent history. Attempts were made in August and September, 1914, and again in May, 1915, to get definite information concerning these non-residents. For 85 of them quite definite information was obtained; for 11 it was unsatisfactory and for 51 no information was received. No cases were reported to have occurred in this group. The largest number of transients were harvest hands, concerning whom no data could be obtained since they had scattered over the harvest fields of three states before it was time for prodromes to develop. From 500 to 1,000 men on their way to the harvest fields made Benson their headquarters between July 18 and August 12. Two of these men are known to have developed typhoid fever, but they were longer exposed than the average transient, each having been in Benson during the entire time the city water was polluted and each having consumed more than the average amount of water.

DETAILED STUDY OF OUTBREAK.

Dr. H. A. Burns was in the field during the height of the epidemic, assisting the local physicians in the investigation of cases and suspected cases. All detailed information was collected by him from the patients themselves or from their families. Following the epidemic Benson was visited three times to assist in the follow-up of convalescents.

An attempt was made to determine how many "carriers" resulted from this epidemic, but unfortunately the cases could not be followed up sufficiently to ascertain all possible lingering infection. Blood specimens for the Widal reaction were taken from 35 recovered cases between November 20, 1914, and January 1, 1915. In 10 the reaction was present, while in 25 it was absent. Out of 46 blood tests made later than January 1,



Kymulookum outbreak started
 State Board of Health notified
 Inventory and release of 400 persons in one-quarter of the entire population. No great alarm.

1915, but 10 gave a positive Widal reaction, the remaining 36 giving a negative result. Discharges for the search of typhoid bacilli were received from but 4 of these 10 possible "carriers," and from the feces of two typhoid bacilli were isolated. Only one examination was made in each of the other 2 cases.

Primary and Secondary Cases:—One hundred and six cases, or 90 per cent are classed as primary. Three questionable cases are included, since the greater amount of evidence pointed to city water as the route of infection. The number is not great enough to materially influence the percentage. The last primary case developed first symptoms on September 12, thirty days after the installation of the hypochlorite plant. In this case the city water appeared to be the only possible route of infection.

There were 12 (10.1%) secondary cases occurring in nine (10%) of the 90 families. In three families a primary was followed by a single secondary case. In one family a single primary was followed by two secondary cases. In one family two primary cases were followed by a single secondary. In one family two primary cases were followed by two secondary cases. Three primary cases in one family were followed by a secondary. Two cases, secondary to a case in a neighbor's family, and a nurse, secondary to the patient she was attending, occurred in families which had no primary cases.

Seventeen cases, 10 primary and 7 secondary, which occurred in the country adjacent to Benson are included in this epidemic since the primary cases received their infection through the consumption of the polluted city water in Benson. Separating the country from the city cases, we find the secondary cases in Benson proper to number 5 in a total of 101 cases, or 4.9 per cent, while in the surrounding country there were 7 secondaries in a total of 17 or 41 per cent.

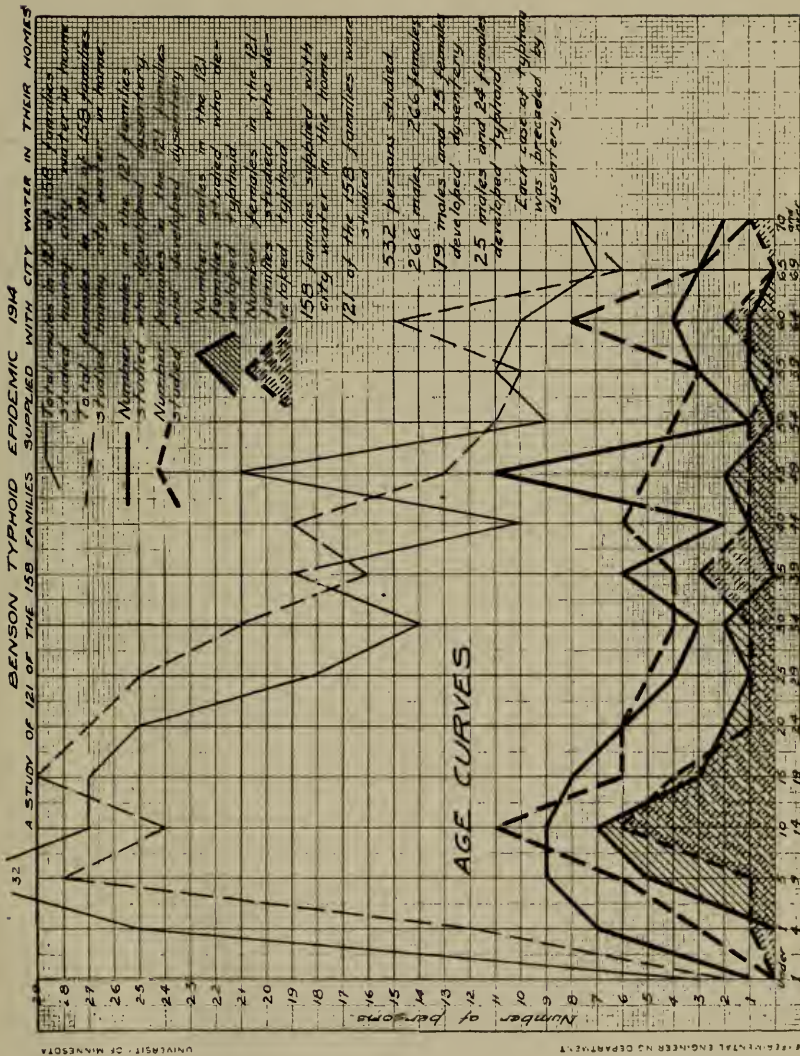
TABLE II—Showing Primary and Secondary Cases in Family Groups

No. of Cases per Family	Primary Only	Prim. 1 Sec. 1	Prim. 1 Sec. 2	Prim. 2 Sec. 1	Prim. 2 Sec. 2	Prim. 3 Sec. 1	Secondary Only	Total Families	Totals Case
1	67	0	0	0	0	0	1	68	68
2	14	3	0	0	0	0	1	18	36
3	0	0	1	1	0	0	0	2	6
4	0	0	0	0	1	1	0	2	8
Total.	81	3	1	1	1	1	2	90	118

Chronological Incidence of Cases:—The accompanying chart gives the chronological occurrence of cases in detail. Beginning with the 14th day after the pollution of the water supply up to the 27th day the cases developing were numerous, varying from three to twelve daily, except on the 16th day when but one case developed. Following the 27th day, 24 hours after the installation of the hypochlorite treatment, the cases diminished markedly and at the end of the 10th day of this treatment all but five of the primary cases had developed symptoms.

If we accept fourteen days as the average period of incubation in water-borne typhoid fever, it would appear that the infection had been exhausted from the water supply and that the epidemic had already become self-limited as far as primary cases are concerned before the outbreak was reported to the State Board of Health.

Users of City Water.—A sharp outbreak of diarrhea affecting about 500 persons or one-fourth of the entire population, and lasting from 3 to 6 days, occurred about 4 days after pollution of the water supply.



Ages by 5 year periods

Reliable information concerning the incidence of cases was obtained from over 75 per cent of the families receiving city water in their homes. There were 532 persons at home during July in the 121 families investigated. In 72 of these families, 154 members developed diarrhea beginning July 20 to 27 and lasting from two to five days. Forty-seven cases of diarrhea later developed typhoid fever in 34 of these families. Two cases developed typhoid fever without the pre-typhoid diarrhea. In 47 families with 376 members there were no reports of either diarrhea or typhoid fever.

In the 121 families studied, the amount of city water consumed by each individual was recorded under "much," "moderate" and "none." Those who consumed the most gave the highest case rate both for the initial diarrhoea and for typhoid as shown by Table III:

TABLE III—Showing Attack Rate for Consumers of City Water

Amount of Water Used	Total Number of Persons Using City Water in the Home	Typhoid Fever		Diarrhea	
		Cases	Attack Rate	Cases	Attack Rate
Much.....	295	42	14.0	70	24.0
Moderate.....	234	7	3.0	37	16.0
None.....	3	0	0.0	0	0.0
Total.....	532	49*	9.0	107	20.0

*Two did not have initial diarrhea.

TABLE IV—Showing Age and Sex Incidence

Age Group	Male	Female	Total
Unknown.....	1	.....	1
1 to 4.....	1	3	4
5 to 9.....	5	5	10
10 to 14.....	9	9	18
15 to 19.....	14	6	20
20 to 24.....	10	9	19
25 to 29.....	9	5	14
30 to 34.....	8	2	10
35 to 39.....	0	5	5
40 to 44.....	1	3	4
45 to 49.....	3	1	4
50 to 54.....	1	1	2
55 to 59.....	1	.....	1
60 to 64.....	1	3	4
65 to 69.....	1	.....	1
70 and over.....	.....	1	1
Total.....	65	53	118

Occupational Incidence:—A study of the occupations of the infected persons does not show any one group of persons especially attacked. Practically all occupations in this community contributed to the list of cases. The larger groups of the population, such as children, housekeepers, farmers, etc., contributed a proportionate number of cases.

Anti-Typhoid Vaccination:—It is regretted that owing to the pressure of work the physicians were unable to keep records of all persons vaccinated. Blood specimens for the agglutination reaction were taken from but a small number of those vaccinated. Three of the four local physicians kept records of 704 persons who received the three inoculations; 57 who received but two doses and 41 one dose only. Three persons developed definite symptoms shortly after receiving their second inoculations. Two of these, who were infected by city water had prodromal symptoms at the time of the second inoculation. The third case was exposed to both city water and contact infection. Six persons who had received but one inoculation developed typhoid fever. All six used city water and one was exposed to contact infection as well. Of the 704 persons completely vaccinated, but one developed typhoid fever. This case lived in a house where two primary cases and one secondary case had previously developed, and exposure to contact infection was continuous from August to December. No agglutination test was made following vaccination in this case. This group of 704 vaccinated persons was exposed more than the average citizen, many having been exposed to contact infection in addition to being users of city water.

A study of the economic and social loss due to the epidemic has been made. Twenty-two persons were cared for in the city hospital. For the care of these cases, together with money paid visiting nurses, physicians and for drugs, the city paid \$2,106. These persons were not interviewed and no statement as to the value of time lost from gainful occupation can be made.

An itemized account of expenditures and value of time lost from remunerative employment was obtained in 95 cases cared for in their homes and this information is detailed in the following table:

TABLE V

Age	Cases		Days Lost		Value of Time Lost		Expenditure		Expenditure and Time Value
	Male	Female	Male	Female	Male	Female	Male	Female	
1-4.....	0	3	0	248	\$ 0	\$ 0	\$ 0	\$ 170	\$ 170
5-9.....	7	3	440	287	0	0	692	501	1,193
10-14.....	7	7	667	685	0	248	614	1,096	1,958
15-19.....	10	6	638	605	413	280	1,059	1,071	2,823
20-24.....	7	8	487	640	1,175	405	848	1,089	3,517
25-29.....	6	5	323	333	632	306	1,067	498	1,067
30-34.....	6	2	374	39	1,350	75	594	13	2,032
35-39.....	0	4	0	272	0	292	0	308	600
40-44.....	1	3	30	308	0	367	82	522	971
45-49.....	1	1	42	35	130	50	179	62	421
50-54.....	0	1	48	240	0	160	0	888	1 018
55-59.....	2	0	40	0	200	0	366	0	566
60-64.....	1	0	51	0	200	0	231	0	431
65-69.....	1	2	90	225	185	80	215	235	715
70.....	0	1	0	70	0	0	0	100	100
Total.	49	46	3,230	3,987	\$4,285	\$2,263	\$5,947	\$6,553	\$19,018

From Table V it will be seen that \$12,500 was spent by families for the direct care of these 95 persons; an average of \$131 for each patient. The value of time lost by these 95 persons amounted to \$6,548 or an average of \$69 for each patient. Adding the value of time lost in the 95 cases and the actual outlay for care of the total number of those who were sick, we have a known economic and social loss of \$21,154.

A further expense of \$2,267 to the citizens was for the administration to exposed persons, of free typhoid vaccine manufactured by the State Board of Health.

In the above statement of time lost and its value, no account is taken of this loss in four cases which ended fatally.

The cost of repairing the sewer system and safeguarding the water supply, though not an inconsiderable amount, should not be added, for it is clear that had the protection of the water supply been adequate, the epidemic would have been averted.

The loss due to decreased earning capacity after returning to work is unquestionably a real loss, but is difficult to estimate and no attempt is here made to estimate it.

In the case of children no value has been placed upon the time lost through illness. Owing to the fact that the epidemic occurred during the summer months, a comparatively few actual, school days were lost by most of the school children. Twenty-six children were sick during 217 school days and the health of two of these was so impaired that they were unable to return to school during the school year. In three others, the scholarship was appreciably lower upon their return to school.

The expense to the state for services and supplies furnished by the State Board of Health is not included in the above estimate. This assistance was given by an epidemiologist, a chemist, and an engineer in the field, and by laboratory workers in water analyses, in diagnostic tests of blood and discharges and in the preparation of prophylactic vaccine, 3,630 c. c. of which was furnished.

SUMMARY AND CONCLUSIONS.

From July 25 until December 27 there were 118 cases, four of which ended fatally. The abrupt rise and fall in the incidence of cases which occurred between August 1 and August 26, beginning about 14 days after the pollution of the water supply, marks this epidemic as typically water-borne. The recognition of water as the route of infection was easy from the beginning, since all primary cases save one consumed city water as such, while the exceptional case doubtless consumed it under the guise of butter-milk obtained from a creamery which used city water. The primary cases in Benson alone approximated 10 per cent of those supplied with city water and 5 per cent of the general population.

A comparison of the small number of secondary cases in Benson proper less than 5 per cent, with the 41 per cent of secondaries among the 17 cases which developed in the surrounding country, points to the value of the services of thoroughly trained workers and of the use of typhoid vaccine. In the case of the country cases there were no trained nurses, and in addition, the members of infected families refused vaccination.

Faulty construction in water and sewerage systems sooner or later brings about epidemics of this kind. The value of frequent inspection by sanitary experts and the constant supervision of the operation of such systems by trained men, is obvious.

A Social and Economic Study of the Tuberculous
in Two County Institutions

By DR. H. G. LAMPSON
Epidemiologist

Division of Preventable Diseases

A SPECIAL STUDY AND REPORT

By order of DR. H. M. BRACKEN, Executive Officer, State Board of Health

A SOCIAL AND ECONOMIC STUDY OF THE TUBERCULOUS IN TWO COUNTY INSTITUTIONS.

By H. G. Lampson, M.D., Epidemiologist.

(November 26 to December 8, 1914.)

This study was made chiefly to learn the relationship between tuberculosis and the financial and social condition of the patients. Inquiry was made along these lines as to habits, methods of living, etc.

In the first group studied, the inmates of the tuberculosis pavilion at a poor farm, the question kept most prominently in mind was "Why is this patient in the alms house?"

In the group at a county sanatorium, the question of interest was, "How much has the disease affected the economic condition of the patient and how much has the economic condition of the patient affected the course of the disease?"

While the study had nothing to do with the equipment or administration of these institutions, it was noted in the pavilion at the poor farm:

(1) That while the wards were overcrowded and there was no means of separating the advanced cases from the incipient and convalescent, everything was strictly clean, the food good and well prepared and the patients treated with great kindness by the nurse and medical superintendent.

(2) On account of lack of space, however, it is a common occurrence for advanced cases to die in the crowded wards; in fact, all deaths occurring in the pavilion occur in the wards in the presence of from 4 or 5 to 15 patients.

(3) The Superintendent has no power of restraint over the patients, and it was stated that it was not a rare occurrence for certain advanced cases to leave the institution for days at a time and to be returned from the Police Department after being taken up for drunkenness and vagrancy.

(4) It was stated that since the pavilion was opened there have been no religious services conducted there. Regular service is held weekly in the Alms House, however, and the ambulatory tuberculosis patients have permission to attend these meetings under precautions. None, or few, however, avail themselves of the privilege. The Catholic patients can have the services of a priest on application, and these are called in to minister to the dying. Besides these, representatives of an order called the "Bible Truth Society," call and distribute tracts among the patients. They are said to be disciples of a rather harsh creed and are not welcomed by the patients. No Christmas service is held in the tuberculosis pavilion.

Among thirty patients in the poor farm pavilion whose histories were taken, eight were judged to be of the type not generally found or who, at least, should not be found in such an institution. Apparently these were here through misfortune and are well behaved, self-respecting men. The others were all of two types, those who have fallen through drink or other vices and those who acknowledge their unwillingness to work more than was necessary to support life.

The county sanatorium, which has a normal capacity of forty patients, is beautifully located in a natural forest on the northern slope of a deep and wide valley at an elevation of 1,300 feet above the sea.

Various improvements are being made, the most important of which is an addition to the sanatorium with a capacity of 35 to 40. The new building is of fireproof construction and will be used as the infirmary. Besides the main building there is a children's cottage, in which are housed about 15 of the younger children. These are provided with a kindergarten, while the older ones are kept in touch with their suspended school work by appropriate instruction. A half dozen tents and a few temporary rough board shacks were being used to house some of the adults.

The family idea is followed out most successfully. The patients, without regard to their social condition or antecedents, are here together with the

official family, all on the same social plane. Cliques, "sets" and unduly intimate friendships are avoided by a most discreet chaperonage and the administration deserves great credit for the skillful handling and directing of the social life among the patients.

Simple amusements, games, pictures, music, etc., are provided and thoroughly appreciated, while the necessarily gruesome features of the institution are quietly kept in the background.

Of the seventy-one now being cared for, fifty-five are free patients provided for at the state and county expense. Twelve are paying half rates or less and four only are paying in full the established rates.*

A modified form of treatment by graduated exercise is used in conjunction with other treatment and the exercise in many cases takes the form of useful work for which the patients are paid at the rate of twenty-five cents per hour. A few graduate patients are in the permanent employ of the sanatorium. It is the ambition of the administration to add to the land holdings and establish more or less permanent colonies of arrested or healed patients who are expected to become largely self-supporting through gardening, poultry-raising, etc.

There are, in the group of patients in the tuberculosis pavilion of the county alms house, 30 individuals, all of whom are over 20 years of age. In the county sanatorium there are 31 patients over 20 years of age and for purposes of comparison these two groups are used.

The patients in the county sanatorium under 20 years of age are regarded as having a somewhat different aspect from an economic and sociological point of view and so are not considered in this comparison.

The following table shows the comparison of two merging groups of patients, arbitrarily divided into alms house and sanatorium groups by the simple fact of residence. As a matter of fact there are patients in each place now who have been in the other—several in the alms house who will be moved to the sanatorium as opportunity offers and a few in the sanatorium at present who will probably, if discharged, gravitate to the alms house. However, the bulk of the patients in each institution are properly placed from a social point of view, a large majority of the alms house patients being typical of such an institution, while a larger majority of the sanatorium patients come from higher in the social scale.

*Some patients of all these classes are doing work for which they receive credit.

	Alms House Pavillion	County Sanatorium
Number of patients.....	30	31
Average age, years.....	45	29½
Married.....	3	9
Single.....	25	20
Widowed.....	1	2
Not stated.....	1	0
Nationality and Place of Birth		
Swedish.....	5	8
American.....	7	5
Polish.....	1	1
Finnish.....	8	5
Scotch.....	2	0
Russian.....	1	1
English.....	2	0
Norwegian.....	2	5
Austrian.....	2	3
Italian.....	0	1
Irish.....	0	1
Welsh.....	0	1
Last Home		
Foreign countries.....	20	8
United States.....	10	23

	Alms House Pavilion	County Sanatorium
Relatives; Financial Condition and Residence		
Good.....	1	0
Fair.....	7	18
Poor.....	21	13
Not stated.....	1	
United States.....	20	28
Foreign countries.....	6	3
Not known.....	4	0
Dependents		
Family.....	3	10
Parents.....	2	3
None.....	25	18
Social Affiliation		
Lodge—Active.....	1	5
Lapsed.....	1	0
None.....	28	26
Church—Protestant.....	19	21
Catholic.....	10	9
No information.....	1	Jew 1
Union—Active.....	0	2
Lapsed.....	2	0
None.....	27	29
Not stated.....	1	
Insurance—Active.....	0	9
Lapsed.....	2	2
None.....	26	10
Hospital ticket.....	2	0

	Alms House Pavilion		County Sanatorium
Last occupation—		Last occupation—	
Night watchman.....	1	Music salesman.....	1
Dock laborer.....	1	Dock laborer.....	1
Car washer.....	1	Elevator operator.....	1
Road and street laborer.....	2	Carpenter.....	1
Saloon porter.....	2	Poolroom employee.....	1
Day laborer.....	3	Laborer.....	3
Cook.....	4	Teamster.....	1
Railroad section-hand.....	6	Shop foreman.....	1
Woodsmen.....	5	Woodsmen.....	2
Miner.....	1	Miner.....	1
Saw-filer (camp).....	1	Clerk and office work.....	4
Fireman (steam shovel).....	1	Barber.....	1
Farmer.....	1	News reporter.....	1
Shoe-maker.....	1	Machinist.....	1
		Waitress.....	1
		Housework.....	10

6 skilled; 24 non-skilled; 0 clerical.

14 skilled; 11 non-skilled; 6 clerical.

	Alms House Pavilion	County Sanatorium
Occupation Given up Because of:		
Tuberculosis.....	26	31
Accident.....	2	0
Unemployment.....	2	0
Period of Disability		
1 to 6 months.....	4	2
6 to 12 months.....	6	8
1 to 2 years.....	8	13
2 to 3 years.....	5	4
3 to 4 years.....	2	2
Over 4 years.....	2	2
Not stated.....	3	0
Period of Illness		
1 to 6 months.....	1	1
6 months to 1 year.....	7	4
1 to 2 years.....	6	9
2 to 3 years.....	4	8
3 to 4 years.....	7	4
Over 4 years.....	3	5
Not stated.....	2	0

	Alms House Pavilion	County Sanatorium
Period in Institution		
1 to 30 days.....	3	1
1 to 3 months.....	4	1
3 to 6 months.....	7	3
6 to 12 months.....	6	16
1 to 2 years.....	3	7
Over two years.....	7	3
Stage of Disease		
Incipient.....	2	2
Moderately advanced.....	18	7
Far advanced.....	8	20
Quiescent.....	2	2

Other Treatment in other Institutions

	Alms House Pavilion	County Sanatorium
Minneapolis City Hospital.....	1	1
Nopeming.....	1	2
None.....	28	17
		Sanatorium not named.....
		Thomas Hosp., Minneapolis..
		"General Hospital", Duluth..
		Alms House pavilion.....
		State Sanatorium.....
		St. Luke's Hosp., Duluth....
		St. Mary's Hosp., Duluth....
		None.....

	Alms House Pavilion	County Sanatorium
Exposure		
Definite.....	10	20
None known.....	9	9
No accurate history.....	11	2

Type

	Alms House Pavilion—			County Sanatorium—		
	Mental	Moral	Physical	Mental	Moral	Physical
Good.....	12	9	15	26	27	22
Fair.....	10	10	2	5	3	3
Poor.....	8	11	13	0	1	6

Money Loss in Wages and Expense Paid by Patient

	Alms House Pavilion	County Sanatorium
\$100.00 to \$500.00.....	9	1
500.00 to 1000.00.....	9	12
1000.00 to 2000.00.....	4	12
2000.00 to 3000.00.....	4	2
Over 3000.00.....	4	4
Total to date.....	\$83,000.00	\$44,600.00
Total time lost.....	870 months	590 months
Average age.....	45 years	29½ years
Average time lost.....	29 months	19 months
Average money loss.....	\$2,250.00	\$1,440.00
Average loss per month.....	77.50	76.00
Loss in Expectancy		
Total.....	21	16
50% to 75%.....	3	8
20% to 50%.....	6	7

It will be seen that the average age of the Alms House Group (called hereinafter, Group 1), is 15½ years greater than that of the Sanatorium Group (Group 2). Only one-third as many of Group 1 were married as of Group 2 and less than one-half as many had established homes in this country, although more of them were born here. Only one-third as many of Group 1 had dependents as of Group 2; one-fifth as many had active lodge

affiliations and none of Group 1 had active insurance, while 9 of Group 2 were so protected.

In occupation, Group 1 had 6 skilled and 24 non-skilled workers, while Group 2 had 14 skilled, 11 non-skilled and 6 clerical workers.

The average period of disability in Group 1 was 29 months and of Group 2, 19 months, while the average period of illness was about 29 months in each group. Each group has averaged 12 months in an institution, but this equality is attained through 23 of Group 2 remaining from 6 months to 2 years and 7 members of Group 1 remaining 2 to 4 years, and while 14 of Group 1 remained less than 6 months, but 4 of Group 2 had so short a period of residence.

Eight of Group 1 were "far advanced" and 20 of Group 2 were so classed.

Only 2 of Group 1 had had other institutional treatment while 14 of Group 2 had been in other institutions.

Ten of Group 1 could give definite history of exposure, while 20 of Group 2 could give such history.

In mental, moral and physical rating, the number rated "good" in Group 1 was less than half that of those so rated in Group 2.

The average money loss per month per patient is \$77.50 for Group 1 and \$76.00 per patient for Group 2. While the normal earning power of Group 2 was low on account of the number of females contained in it, these people and their friends spent considerable sums of money for treatment and this, added to loss in earning, raises the pro rata of loss. The pro rata loss of Group 1 was appreciably raised by the fact that two members who had been men of comparatively large earning capacity had suffered long periods of disability.

To sum up, Group 1, as compared with Group 2, shows low mentality, poor moral stamina, lack of ambition and improvidence.

It would seem that, as the county finds it necessary to increase hospital space for the care of tuberculous patients, it would be better to enlarge the county sanatorium and there care for all cases not strictly alms house cases, and also, by enlarging the infirmary at the sanatorium as more room is required, take care there of the advanced bed cases from the pavilion. The pavilion, with a few minor alterations, should be adequate to care for the alms house population indefinitely.

REPORT OF

The Division of Preventable Diseases

Minnesota State Board of Health

January 1, 1914 to January 1, 1916

BY

A. J. CHESLEY, M. D., Director
O. McDANIEL, M. D., Assistant Director
E. M. WADE, M. A., Chief, Main Laboratory

REPORT OF The Division of Preventable Diseases Minnesota State Board of Health

January 1, 1914 to December 31, 1915

INTRODUCTION.

In May, 1914, the Board rearranged the work of the Laboratory Division, the Engineering Division and the Division of Epidemiology, and organized a Division of Sanitation and a Division of Preventable Diseases, the composition and duties of which were outlined by the Board as follows:

The Division of Preventable Diseases shall consist of:

1. Main offices and laboratories with sub-divisions of epidemiology, main laboratory and Pasteur Institute, which may be further sub-divided or supplemented.
2. Branch laboratories established and conducted by the State Board of Health alone, or in co-operation with the authorities of municipalities, counties, state institutions and other official or voluntary organizations.

The special duties of the Division of Preventable Diseases, shall be:

(a) To record, tabulate and study official reports of communicable diseases within the state, to check the completeness of official returns and to investigate unofficial reports.

(b) To make investigations of the existence, prevalence, source and modes of spread of all these diseases within the state and to report the findings promptly to the executive officer of the State Board of Health. Recommendations for abatement shall be made to the executive officer, either directly or after consultation with other divisions concerned.

(c) To supervise the adequacy of local administrative measures in dealing with the control of preventable diseases, and to report to the executive officer of the State Board of Health whenever the measures being taken by the local authorities are not deemed sufficient.

(d) To make special investigations of problems whose solution may prove of value in conserving public health, or in the advancement of science.

(e) To produce and furnish or administer preventive and remedial biochemical agents.

All diphtheria virulence tests and other special diagnostic tests requiring the use of animals are made in the Main Laboratory. Typhoid vaccine is also prepared in the Main Laboratory, the work of the branch laboratories being necessarily confined to routine diagnostic tests. When an epidemic requires examination of a large number of cultures, they are taken to the Main Laboratory, even though collected in territory tributary to a branch laboratory, but the branch laboratory examines the subsequent cultures from clinical cases, suspects, etc. The Pasteur Institute maintains the animal house and furnishes all animals used by the diagnostic laboratories.

The Main Laboratory supplies the branch laboratories and the Division of Sanitation with media for their work and cleans and prepares for use, and sterilizes, all glassware, etc.

The character of the work done by the different sub-divisions is outlined in their respective reports.

PERSONNEL.

The work of the Main and Branch Laboratories and the Pasteur Institute, before the reorganization, was conducted under the direction of Dr. R. H. Mullin, who became director of the new Division of Sanitation.

The duties of the workers transferred to the Division of Preventable Diseases were unchanged. The technical staff comprised the following:

- A. J. Chesley, M.D., director.
 - *O. McDaniel, M.D., assistant director.
 - *E. M. Wade, M.A., chief, main laboratory.
 - *T. R. Martin, B.A., M.D., bacteriologist in charge, Duluth and St. Louis county branch laboratory (part time).
 - *C. C. Pratt, B.A., M.D., bacteriologist in charge, Mankato branch laboratory (part time).
 - H. A. Burns, M.D., epidemiologist.
 - W P. Greene, M.D., epidemiologist.
 - H. G. Lampson, MD., epidemiologist (part time until Septemger 15, 1914; then full time).
 - A. R. Blakey, B.A., special agent (part time to August, 1914, only).
- *Transferred with one stenographer, two clerks and five attendants from Laboratory Division. Others transferred from Division of Epidemiology with three stenographers.
- Note: Miss M. B. Stark, B.S., served as assistant bacteriologist in the Main Laboratory from September 1, 1914, to May 1, 1915.

CHANGES MADE AFTER REORGANIZATION.

The data slips previously used in mailing outfits were modified as follows:

1. **Diphtheria:** The old form data slip was of thin, blue paper, blank on one side. The new form is of stiff post-card stock with both sides printed:

DIPHTHERIA DATA

Division of Preventable Diseases, Minnesota State Board of Health,
University Campus, Minneapolis

Please fill out this blank IN FULL and place around the small can.

Date and hour of taking culture..... Is this the first culture?.....

Patient's name..... Sex..... Age.....

*Township } Residence..... County.....
Village }
City } (See other side if a Township Case)

Post Office Address.....
(Give street and house number; name and location of hospital, farm, camp, etc.)

Date of first symptoms..... Is membrane present Temp.....

Clinical Diagnosis..... See other side if in a Township

This culture is *from a sick person for bacterial diagnosis.
from a recovered case for release from quarantine.
from a well person merely exposed to infection.

Physician..... Address.....

Health Officer..... Address.....

Do you desire a telegraphic report sent collect Or culture outfits

*Strike out words that do not apply. (See other side)

ADDITIONAL DATA FOR TOWNSHIP CASES ONLY

This case is *less than two miles from the nearest *city which is.....
more village (Give name of place)

and is a *public school *teacher in..... School¹
parochial pupil (Name and locate school or give district number)

When the sore throat began, was the patient attending this school? *no
yes

Remarks

*Strike out the words that do not apply.

Directions for Collecting Blood Specimens for Widal reaction.

1. Cleanse thoroughly, the lobe of the ear, or the end of finger (or toe in infant) from which the blood is to be collected.
2. Prick the skin deeply with a sterile needle or lancet.
3. Collect four or five separate drops of blood directly upon the aluminum foil, near one edge.
4. Make a loose roll of the foil, turning the blood inward without smearing it. Flatten one end of the roll and fold over the edge to prevent it from unrolling.
5. ALLOW THE BLOOD TO DRY, then flatten the roll and fold over the edge of the other end.
6. Fill out the data blank IN FULL, designating always whether specimen is for diagnosis or for vaccination data.

An addressed, but unstamped envelope was adopted for the outfit, which, when complete, consists of this envelope, a "Typhoid Data" card and a piece of thin aluminum foil, two inches square. Suitable changes were made in the report blanks so that one form suffices for both the specimens for diagnosis and those for vaccination data.

3. **Tuberculosis:** Old form of sputum data slip was of quite heavy yellow paper with provision for data on its face and the directions printed on its back. A new data card of post-card stock was devised as follows:

SPUTUM DATA

Division of Preventable Diseases, Minnesota State Board of Health,
University Campus, Minneapolis

Please fill out this blank IN FULL and place around the small can.

Patient's Name.....Sex.....Age.....

*Township }
Village } Residence.....County.....
City }

Post Office Address.....
(Give street and house number, name and location of hospital, farm, camp, etc.)

Occupation: 1.....
(At Present) Note: Use definite terms in giving occupations

*White { *Married }
Negro { Single } 2.....
Indian { Widowed }
(At the time the disease appeared)

Coughing, how long?.....Expectorating.....

Date of collecting sputum.....Have tubercle bacilli been demonstrated?.....

If so, when?.....By whom?.....

Clinical diagnosis.....Do you desire sputum outfits?.....

Physician.....Address.....

Health Officer.....Address.....

*Strike out words that do not apply. (SEE OTHER SIDE)

DIRECTIONS

- (1) Label sputum bottle with patient's name and address and give it to patient, calling attention to the attached directions.
- (2) Get directly from the patient or his immediate family, the data required, and fill out IN FULL, the data blank, in his presence.
- (3) After collection of the sputum, wash the outside of the bottle with 5 per cent carbolic acid, test the stopper to insure against leakage, and repack the bottle, together with the data blank completely filled out, in the original container.

Send by *mail or express prepaid, to Division of Preventable Diseases.

MINNESOTA STATE BOARD OF HEALTH,
University Campus, Minneapolis.

*Parcel post rates, see Postal Laws and Regulations, Sections 483 and 495.

Another heavy yellow paper slip included in the sputum mailing outfit contained general information about sputum tests. It was replaced by a more simple form on thin white paper, as follows:

INFORMATION CONCERNING SPUTUM EXAMINATIONS
Division of Preventable Diseases, Minnesota State Board of Health

- (1) Examination of sputum for tubercle bacilli is made free of charge by the State Board of Health for all residents of the State.
- (2) The routine examination for tubercle bacilli is the microscopic. If repeated microscopic examinations fail to demonstrate tubercle bacilli, guinea-pig inoculations will be made, only on request of the physician, and then at the discretion of the laboratory.
- (3) The accompanying data blank must be completely filled out, otherwise no report will be returned.
- (4) The examination of sputum for bacteria other than tubercle bacilli is not included in the scope of this work.

A new bottle label, gummed at left side only, so that it stands out flag-like when the sputum bottle is held in the hand, was adopted:

DIRECTIONS TO PATIENT

- (1) Do not pour out the carbolic acid.
- (2) Spit directly into bottle without getting the sputum on the outside.
- (3) Collect the sputum raised from the lungs in the morning on awakening. Do not collect saliva or blood.
- (4) Fill bottle only half full.

A new filing envelope was procured, with a window through which the identification data of the case may be read. These data had to be copied on the old filing envelopes. All information pertaining to a case is filed in its envelope. The original specimen data card, filled out by the physician or health officer, and the original laboratory report, are so filed. Carbon copies of the laboratory reports are sent to the local health officer and to the attending physician with suitable "follow-up" material, i. e., letters, circulars, etc.

The epidemiology files for diphtheria, typhoid fever, tuberculosis and other diseases in which laboratory examinations are made had been separate from the laboratory files, but upon reorganization a common file was made to serve for each disease.

These records are complete for the state, since the branch laboratories send to the Main Laboratory every day, carbon copies of their reports on all examinations and also the original specimen data cards made out by the attending physicians or health officers for cases in which the clinical diagnosis is positive or suspicious, or the laboratory findings are positive or suspicious.

A special file for tuberculosis, arranged alphabetically by names of patients, has been made, using 4x6 white library cards. On these cards all useful information relative to a case is entered as soon as received with laboratory specimens or by letters or reports from physicians, health officers, sanatoria, etc. The physical condition of the patient and the results of sputum examinations, and every move made by the patient or his family, are noted. When a patient dies his card is dropped from the file. If he leaves the state all useful data concerning his case is given to the health authorities of the state or province where he has taken up residence.

All these changes increased the efficiency of the work, facilitated checking the release from quarantine, etc., and economized in material and labor.

FORCED SUSPENSION OF CERTAIN WORK IN 1915.

From April 1 to August 1, 1915, epidemiological field work was practically suspended and on May 15 the following notice was sent to health officers in territory tributary to the Main Laboratory:

ATTENTION HEALTH OFFICERS AND PHYSICIANS

The Diagnostic Laboratory of the State Board at Minneapolis will be closed May 15 and no work along the following lines will be done until August 1, when funds become available.

Work discontinued May 15 to August 1, 1915:

- (1) Examination of nose and throat cultures for diphtheria bacilli;
- (2) Virulence tests of cultures from diphtheria convalescents and well diphtheria "carriers";
- (3) Widal tests of blood specimens for diagnosis of typhoid fever;
- (4) Examination of excreta for typhoid bacilli in cases of suspected dangerous typhoid "carriers";
- (5) Examination of specimens of sputum for tubercle bacilli;
- (6) Animal inoculation tests of pus, etc., from suspected cases of non-pulmonary tuberculosis.

The State Board of Health is compelled to close the laboratories, since the Legislature refused to grant funds needed to carry the work to August 1st.

Typhoid vaccine will be issued, free of charge, to physicians, upon request.

Reports of cases of notifiable diseases and correspondence relating to investigation and control of preventable diseases will be attended to promptly.

By Order of the Executive Officer, State Board of Health,
A. J. CHESLEY,
Director, Division of Preventable Diseases.

The Pasteur Institute work was not interrupted, nor was the work of the Duluth and St. Louis County Branch Laboratory, since sufficient funds were available. The Mankato Branch Laboratory continued its work through an arrangement made by Dr. C. C. Pratt to secure financial assistance from the city of Mankato and Blue Earth county.

The control of diphtheria in the territory tributary to the Main Laboratory was affected by the discontinuance of routine culture examinations and it became necessary to issue the following notice:

ATTENTION HEALTH OFFICERS AND PHYSICIANS

Owing to the closing of the State Board of Health Laboratories May 15, time-limit quarantine for diphtheria supersedes control by culture methods until August 1, 1915, when laboratories will resume work. Therefore, since infected well persons cannot be distinguished from non-infected, it will be unsafe, even when the patient is isolated, for Health Officers to permit:

- (1) The sale of milk, cream, butter, or other food or food products, liable to be eaten without being cooked after handling, from premises where diphtheria exists. (See Regulations 312 and 705.)
- (2) Release from quarantine of persons associated with the case. (See Regulation 708.)
- (3) Release from quarantine of members of household employed at gainful occupations (See Regulation 705), except when unusual hardship would be imposed and the employment is such that opportunity for spread of diphtheria infection would be negligible. In such cases, local Health Officers are advised to report the facts to the Executive Officer, State Board of Health, Capitol, St. Paul, before assuming responsibility for release of wage-earners.

QUARANTINE MUST BE CONTINUED AT LEAST THREE WEEKS AFTER DISAPPEARANCE OF ALL CLINICAL SYMPTOMS OF DIPHThERIA.

Health Officers are advised to forbid the attendance of recovered patients at any public, private, parochial, church or Sunday School, or any public or private gathering until at least six weeks after the disappearance of all clinical symptoms.

Regulations 301-302-303-304-305-306-308-309-310-311-313-314-318-319-320-321-322-402-403-700 and 701 relating to the control of diphtheria, are not affected by this temporary change from culture method of release to time quarantine.

Cultures for release of quarantine should be taken from all cases in quarantine August 1, 1915.

By Order of the Executive Officer, State Board of Health
A. J. CHESLEY,
Director, Division of Preventable Diseases.

EFFECT ON DIPHThERIA CONTROL.

It was anticipated that the lack of laboratory service in diphtheria examinations which had been given seven days a week since April, 1896, would be followed by laxity in reporting of cases and in management of quarantine, but no one realized to what extent the laboratory examinations entered into the problem until it was reviewed in January, 1916. It was then discovered that the cases reported from territory tributary to the

Main Laboratory formed the following percentages of the total numbers of cases reported month by month in the whole state:

	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1914.....	41.2%	39.7%	76.0%	52.3%	40.4%	55.8%	57.9%	40.0%
1915.....	48.8%	11.0%	33.8%	53.0%	49.4%	46.4%	42.9%	34.5%

The territory tributary to the branch laboratories being served throughout both years was under normal conditions, while that tributary to the Main Laboratory was under normal conditions in 1914, but was deprived of service from May 15 to August 1, 1915. Notice that laboratory service would be discontinued was not given until May 15, too late to affect reporting in May. Conditions became normal in August, owing to the fact that all health officers had been notified to send in cultures from every case in quarantine August 1.

The months of June and July, 1915, show the influence of laboratory service on the reporting of diphtheria. Practically 40 per cent of all the diphtheria in the state was reported from territory tributary to the Main Laboratory in June, 1914, but only 11 per cent was reported from this territory in June, 1915. In July, 1914, the percentage of total reports was 76, while in July, 1915, it was only 33.8. In August, 1915, when laboratory service was resumed the percentage came up to normal in the territory tributary to the Main Laboratory and has so continued. Fortunately, schools were not in session and June and July are the months of low prevalence in diphtheria. Before schools opened the culture-control method was again in full operation, otherwise, there certainly would have been a great increase in diphtheria fatalities because of the impossibility of enforcing adequate measures for control without the information to be obtained only through laboratory examinations.

May 15, 1915, in the Main Laboratory the assistant bacteriologist, a stenographer, a clerk and two laboratory attendants were dropped for lack of funds. The salary of the bacteriologist in charge, Mankato Branch Laboratory, was stopped until August 1. The Board, for lack of funds August 1, 1915, lost the services of Dr. H. G. Lampson, epidemiologist, whose tuberculosis-survey work is well known throughout the United States. Little field work in tuberculosis could be done after Dr. Lampson left the service and it has been impossible to meet many demands for emergency epidemiological work.

Previous to May, 1915, an accumulation of a large amount of office work had occurred and the reduced office staff was unable to clear up this work before August 1, when both laboratory and field work were resumed, and carry on the correspondence, the follow-up work, and the routine morbidity work in relation to communicable diseases.

The care of offices and laboratories, the making of media, sterilization and preparation of glassware, etc., for the branch laboratories and the Division of Sanitation, the manufacture of typhoid vaccine, the continuance of diagnostic tests for all persons entering certain state institutions, and the completion of a piece of research work of several years' standing, was a severe tax on the reduced laboratory staff. No assistant bacteriologist was provided during the remainder of 1915, although the average number of routine laboratory examinations per diem was 80.1 and the heaviest routine in the history of the laboratory occurred during the months of October and November, 1915. Sputum examinations had to be delayed during that time in order to get out the urgent diagnostic work on time.

Statistics collected from nine leading state and municipal laboratories show the average number of examinations per annum to be 17,572 and the average number of technical workers to make these examinations, 5.2. During 1914, in the Main Laboratory, 37,696 examinations were made by two workers. They found it impossible to complete the routine work within the regular hours (9 to 5 on week days and 9 to 1 on Sundays and holidays) and much of the laboratory work was done at night.

Conditions demanding such personal sacrifice in order to carry on the daily routine work should not be permitted to exist. It is hoped that sufficient funds will be provided to remove the serious disadvantages under which the work is now conducted, and to allow the professional staff at least a part of the opportunities for study and scientific research that are considered necessary for efficiency in public health laboratories elsewhere.

RECOMMENDATIONS FOR FUTURE WORK.

To handle the normal increase in the present schedule of laboratory work it is necessary to secure **additional bacteriologists** at once. To extend the laboratory service along certain lines in order to get the maximum benefits from methods of investigation and control in communicable diseases, is most desirable. For example, a **field laboratory equipment** should be provided for use in school and institutional diphtheria outbreaks, when it is often necessary to examine hundreds of cultures in a day. Such equipment would be used in the field when typhoid outbreaks occur and in the routine tracing and identifying of typhoid "carriers" who are unquestionably responsible for the infection of a very large proportion of the typhoid cases in Minnesota. The **examination of specimens of discharges** from suspected typhoid "carriers" is seriously handicapped by the delay due to transit. When the specimens are obtained, the laboratory is notified by wire and someone meets the train and takes the specimens to the laboratory where everything has been prepared for immediately starting the tests for isolation of typhoid bacilli. In spite of such arrangement and the fact that on many occasions the bacteriologists have returned to the laboratory after midnight to take care of specimens arriving on late trains, the time interval is often so great that the isolation tests have to be repeated because the typhoid bacilli are not found.

The **educational value** of conducting diagnostic tests on the spot during outbreaks of diphtheria, typhoid fever, etc., would be great. The saving in time on laboratory reports is a very important factor in the prevention of the spread of communicable diseases. Early, accurate diagnosis and prompt application of suitable measures for control and prevention, spell success in communicable-disease work.

The **Schick test** should be made available for use in the detection of individuals susceptible to diphtheria. The most intelligent and economical use of the free antitoxin furnished by the state cannot be made without the application of the Schick test. The use of the **toxin-antitoxin method of immunization** against diphtheria would be of great value and should be provided for.

Free service should be given at least to state, county and municipal institutions and free dispensaries, in the **complement fixation tests** for syphilis and tuberculosis. In these two diseases such tests are invaluable to the individual as guides to treatment, and to the community as the basis for prophylactic measures.

Recently, certain **new methods of anti-rabic treatment** have been advocated as having advantages over the method devised by Pasteur in 1885 and since used by Pasteur Institutes throughout the world with great success. These new methods should be tried out experimentally on animals and if any is found to possess advantages over Pasteur's method, it should be adopted. An opportunity should be given for such experiments and for certain research work in relation to anti-rabic treatment, and to the diagnosis of rabies. Although definite plans for such work were made long ago, it could not be undertaken on account of the lack of funds and because the Chief of the Pasteur Institute has given every hour which could be spared from the regular work of the institute to the work of the diagnostic laboratories, where the excessive amount of daily routine could not be carried without her aid.

It has been physically impossible for the two epidemiologists to meet the requests for assistance in emergency field work. Four epidemiologists could handle the emergency work under ordinary conditions, but many investigations, if real prevention of disease is esteemed desirable by the people of Minnesota, would have to wait until all demands for assistance in control of existing outbreaks had been fulfilled.

At present much of the value of the epidemiologists' field activities is lost for lack of specially trained nurses to supplement their work. A **Field Nurse Corps** would be a most economical investment for the state as an addition to the forces now engaged in the control and prevention of communicable diseases. These nurses would be fully instructed in the principles and practice of communicable-disease work and thoroughly trained to execute quickly and efficiently, the many details of intensive epidemic work. At this time it is necessary to secure the best fitted nurses available at the moment and train them on the "firing line" at the expense of the afflicted community.

There is no kind of work in which thorough training counts more than in the control and suppression of outbreaks of communicable diseases. Reasonable protection of property demands trained fire departments provided with up-to-date equipment, but the state has seemed willing to jeopardize the health and safety of its citizens and particularly the lives of its children, through neglect to provide a reasonable number of specially trained bacteriologists, epidemiologists and public-health nurses.

During the biennial period the Division staff have given over fifty public health lectures and demonstrations for the students of the different departments of the University. Papers have been published as follows:

The Significance of Typhoid Carriers in Community Life, With a Practical Method of Detecting Them. By O. McDaniel, M. D., and E. M. Wade, M. A., Health Officers' Section, American Public Health Association, December, 1914.

Observations on the Widal Reaction Following the Administration of Typhoid Vaccine. By E. M. Wade, M. A., and O. McDaniel, M. D. Laboratory Section American Public Health Association, December, 1914.

Significance of the Widal Reaction. By E. M. Wade, M. A., Minn. Path. Soc., February, 1915.

The Widal Reaction in Tuberculous Persons. By A. J. Chesley, M. D., and E. M. Wade, M. A. Nat'l. Assn. for Study and Prevention of Tuberculosis, September, 1915.

The Control of Scarlet Fever. By A. J. Chesley, M. D. General Session, American Public Health Association, September, 1915.

PREVALENCE OF DISEASE.

"No health department, state or local, can effectively prevent or control disease without knowledge of when, where and under what conditions cases are occurring."

Notifiable diseases are divided into two groups for reporting by the Minnesota State Board of Health regulations.

Group 1. The attending physician must notify the Division of Preventable Diseases by **telegram or telephone** immediately when called to a case or suspected case or when a death occurs in order that investigation may be made and necessary orders concerning the control of the disease may be issued to the local authorities by the executive officer of the State Board of Health. Certain diseases in this group have not been found in Minnesota, i. e.:

Asiatic cholera, dengue, hook worm disease, paragonimiasis, plague, Rocky Mountain spotted fever, typhus fever and yellow fever.

The other diseases in the group are rarely encountered in Minnesota, i. e.:

Actinomycosis, anthrax, dysentery (amoebic and bacillary), "Septic Sore Throat" in epidemic form, favus, glanders, leprosy, malaria, paratyphoid fever, pellagra, rabies, tetanus and trichinosis.

Group 2. The attending physician (or other person as specified) must report by **post card** to local health officer in cities and villages and to chairmen of board of supervisors in townships any case or suspected case of

the following diseases commonly found in Minnesota. The local health authority sends the cards to the Division of Preventable Diseases as soon as he has copied the data in his register and has carried out the prescribed measures for protection of the public health:

Anterior poliomyelitis, cerebro-spinal meningitis, chickenpox, diphtheria (laryngeal croup; membranous croup), erysipelas, measles, ophthalmia neonatorum, rabies (person exposed to, etc.), scarlet fever (scarlatina; scarlet rash), smallpox, trachoma, tuberculosis, typhoid fever and whooping cough.

Minneapolis, St. Paul and Duluth health departments make monthly reports but are not required to forward detailed case reports except for certain diseases and for cases infected outside the cities or when persons in other sanitary districts have been exposed to infection.

State institutions are required to report direct to the Division of Preventable Diseases and also to the local health authorities. Sanatoria, hospitals, dispensaries, etc., receiving tuberculosis cases must make monthly reports giving full details regarding cases diagnosed in, or admitted to, or discharged from or who have died in the institution during the month. The Division of Vital Statistics supplies the Division of Preventable Diseases with data from death certificates for communicable diseases and each death is checked to determine if it has been reported as a case. If not so reported, the matter is investigated. Unofficial reports are derived from correspondence, from newspaper clipping bureau service and from other sources and are systematically followed up.

The use to which morbidity reports may be put by a state health department depends upon the character of the reports, the time when they reach the department, the completeness of reporting throughout the state and the departmental organization for communicable disease work. The following table illustrates the incompleteness of reporting:

	Tuberculosis		Diphtheria			Typhoid Fever			Scarlet Fever		
	Reported as		Reported as		Fatal- ity Rate	Reported as		Fatal- ity Rate	Reported as		Fatal- ity Rate
	Cases	Deaths	Cases	Deaths		Cases	Deaths		Cases	Deaths	
1910.....	682	2,258	2,092	566	27.1	1,985	688	34.9	1,095	284	14.9
1911.....	731	2,456	1,520	335	21.8	938	294	31.3	2,265	190	8.4
1912.....	802	2,286	904	173	19.1	783	233	29.7	1,827	104	5.7
1913.....	2,516	2,227	3,073	215	7.0	1,304	235	18.0	3,487	109	5.0
1914.....	3,045	2,388	4,683	354	7.5	1,784	225	12.6	6,655	322	4.8
1915.....	3,859	2,280	2,569	200	7.8	994	156	15.6	3,801	144	3.7

The fatality rates in this table are only "apparent" fatality rates since cases reported by death certificate only are not included under "Cases" but only under "Deaths." For example, in 1915 death certificates were first reports for 765 cases of tuberculosis, 34 cases of typhoid fever and 18 cases of diphtheria. All fatal cases of scarlet fever were properly reported before death.

There has been a marked improvement in regard to tuberculosis as the map on the opposite page shows. In 1914, only 14.5 per cent of all fatal cases of tuberculosis were found to have been reported previous to death. In 1915, over 54 per cent of all fatal cases of tuberculosis were reported properly previous to death. Since this improvement occurred wholly outside the three cities which have more or less adequate tuberculosis dispensary and visiting nurse service, the physicians themselves deserve the credit, although of course such reports are required by law.

Of the 34 typhoid cases mentioned above, 17 died in hospitals. The attending physicians excused themselves by saying that they expected the hospital authorities to report. The hospital authorities stated they supposed the physicians had reported.

Measles and whooping cough reports are useful at present only to demonstrate what needs to be done. In 1915, only 3,178 cases of measles were reported and only 555 cases of whooping cough. Both diseases were epidemic in many localities from which we hear that "About every child who never had the disease before certainly has had it this year." These very serious diseases cannot be handled properly by health officers who are practicing physicians and little advance can be made in the control or prevention of measles and whooping cough until the people have been educated to understand how deadly and disabling these diseases really are.

Smallpox of mild type is a very common disease. It confines itself almost wholly to the unvaccinated. The vaccination classification of the reported cases is as follows:

Class	A	B	C	D	Total	Deaths
1914.....	18	99	1,173	557	1,847	7
1915.....	28	90	1,395	195	1,708	5
Total.....	46	189	2,568	752	3,555	12

A—Those who were successfully vaccinated within 7 years.

B—Those who were successfully vaccinated over 7 years ago.

C—Those who were never successfully vaccinated.

D—Those who have no definite history of vaccination.

For practical purposes Class D cases are the same as Class C. Of the 3,555 cases reported in the biennial period, only 46, or 1.0 per cent were successfully vaccinated within 7 years; and 189, or 5.3 per cent, were successfully vaccinated more than 7 years previously; while 3,320, or 93.7 per cent, never were successfully vaccinated.

The clerical work and correspondence conducted by the Division of Preventable Diseases in relation to the collection and use of reports of sickness are of the greatest importance. A monthly morbidity report for the county is sent with a news letter to each county auditor. Similar reports are sent to the superintendent of schools in certain cities and counties and to newspapers. School nurses report the names of sanitary districts from which non-resident pupils attend their schools and copies of reports of cases of communicable disease are sent by this Division to the nurses, often enabling them to prevent the introduction of infection into their schools. Our records and our follow-up work for communicable disease cannot be handled as they should be, owing to our small clerical force. Only the immediate uses of morbidity reports can receive prompt attention. Statistical work has been done at odd hours generally in the evening by members of the technical staff.

All the useful information is given to the proper health authorities when cases of communicable disease are found in Minnesota which have been infected elsewhere or leave the state while in an infectious condition. Also when persons have been exposed to infection in Minnesota and have gone to other states or provinces the health authorities are notified. Similar information under like circumstances is given to local health officers in Minnesota. The importance of the extra-state cases may be seen by a brief reference to the following list:

RECIPROCAL NOTIFICATION.

Since August, 1912, the proper health authorities, state, federal or provincial, have been notified of reported cases treated in Minnesota, but infected elsewhere, or leaving Minnesota while still infectious, and of non-immunes exposed to infection here, going out of Minnesota before the incubation period of the disease concerned has expired.

This practice was approved by Surgeon-General Blue, of the United States Public Health Service, who requested that a simple compilation of

the extra-state cases be submitted monthly for publication in the Weekly Public Health Reports, under the caption Reciprocal Notification. These reports to the Public Health Service, like all others made by the Division of Preventable Diseases, have been credited since January, 1915, to Dr. H. M. Bracken, collaborating epidemiologist for Minnesota.

Cases of communicable diseases referred during 1914 to other state or provincial health departments:

Typhoid Fever

Minnesota Notification	Referred to Health Authority of	Why Referred
Rochester, Olmsted Co.	Flaxcombe, Sask.	Infected in harvest at Flaxcombe.
Dassel, Meeker Co.	Claybank, Sask.	Taken ill in harvest at Claybank.
Pelican Rapids, Otter Tail Co.	Claybank, Sask.	Threshing near Claybank 3 weeks before first symptoms.
Shakopee, Scott Co.	Denzil, Sask.	Lived in Denzil 3 weeks before 1st symptoms. Contracted disease from daughter (Died Nov. 4, 1914.)
International Falls, Koochiching Co.	Burriss, Ontario.	Contact infection; neighbor's child at Burriss ill with typhoid fever.
Duluth, St. Louis Co.	U. S. P. H. S., Washington, D. C.	Probably infected on Great Lakes steamer.
Duluth, St. Louis Co.	U. S. P. H. S., Washington, D. C.	Firemen (2) on lighthouse tender, Marigold, Great Lakes.
Glencoe, McLeod Co.	American Falls Power Co., Idaho	Infected in harvest at American Falls.
Morgan, Redwood Co.	Morrison Whiteside Co., Ill.	Probably infected at Morrison.
So. St. Paul, Dakota Co.	Gary, Lake Co., Ind.	Infected in Gary.
Two Harbors, Lake Co.	Mt. Pleasant, Henry Co., Iowa	Employee, Iowa Insane hospital, during 3 weeks before 1st symptoms.
Byron, Olmsted Co.	Manly, Worth Co., Iowa.	Fireman, headquarters, Manly, Iowa.
Minneapolis, Hennepin Co.	Marquette, Marquette Co., Mich.	Carpenter at Marquette during 3 weeks before 1st symptoms.
New Ulm, Brown Co.	Niles, Berrien Co., Mich.	Working on farm at Niles during 3 weeks before 1st symptoms.
Minneapolis, Hennepin Co.	Outlook, Sheridan Co., Mont.	Infected at railroad camp at Outlook.
Minneapolis, Hennepin Co.	Plentywood, Sheridan Co., Mont.	Infected at railroad camp at Plentywood.
Minneapolis, Hennepin Co.	Malta, Valley Co., Mont.	Farming near Malta during 3 weeks before 1st symptoms.
Duluth, St. Louis Co.	Missoula, Missoula Co., Mont.	Section hand at Missoula during 3 weeks before 1st symptoms.
Minneapolis, Hennepin Co.	Versailles, Morgan Co., Mo.	Resident in Versailles during 3 weeks before 1st symptoms.
Mankato, Blue Earth Co.	Carterville, Jasper Co., Mo.	Fruit dealer at Carterville during 3 weeks before 1st symptoms.
Mankato, Blue Earth Co.	Nebraska State Board of Health.	Infected on farm in Douglas Co., Neb.
Minneapolis, Hennepin Co.	Ambrose, Divide Co., N. D.	Infected on railroad work at Ambrose.
Minneapolis, Hennepin Co.	Hankinson, Richwood Co., N. D.	Taken ill at Hankinson.
Benson, Swift Co.	Rugby, Pierce Co., and Leeds, Benson Co., N. D.	Visited in Rugby and Leeds 24th and 16th day before 1st symptoms.
Rochester, Olmsted Co.	Balfour, McHenry Co., N. D.	Infected in home at Balfour.
Minneapolis, Hennepin Co.	Marmon, Williams Co., N. D.	On farm at Marmon during 3 weeks before 1st symptoms.
Minneapolis, Hennepin Co.	Jamestown, Stutsman Co., N. D.	Taken ill 9 days after leaving Jamestown.
Minneapolis, Hennepin Co.	Hankinson, Richland Co., N. D.	Resident of Hankinson 3 weeks before 1st symptoms.
Fergus Falls, Otter Tail Co.	Minot, Ward Co., N. D.	Went to Minot, infected in Minnesota.
Minneapolis, Hennepin Co.	Shields, Morton Co., N. D.	Carpenter at Shields during 3 weeks before 1st symptoms.
Lake Park, Becker Co.	Oriska, Barnes Co., N. D.	Threshing at Oriska during 3 weeks before 1st symptoms.

Typhoid Fever—Continued

Minnesota Notification	Referred to Health Authority of	Why Referred
St. Cloud, Stearns Co. (2 cases).	Bowbells, Burke Co., N.D.	Farm hands, Bowbells, during 3 weeks before 1st symptoms.
Detroit, Becker Co.	Clifford, Trail Co., N. D..	Farm hand, Clifford, during 3 weeks before 1st symptoms
Nesbit Twp., Polk Co.	Grand Forks, Grand Forks Co., N. D.	Taken ill in Nesbit; moved to Grand Forks hospital.
Minneapolis, Hennepin Co.	Jamestown, Stutsman Co. N. D.	Bricklayer at Jamestown during 3 weeks before 1st symptoms.
Red Lake Indian Agency, Beltrami Co.	Johnstown, Grand Forks Co., N. D.	Threshing near Johnstown during 3 weeks before 1st symptoms.
Minneapolis, Hennepin Co.	Valley City, Barnes Co., N. D.	Stationary engineer at Valley City during 3 weeks before 1st symptoms.
Minneapolis, Hennepin Co.	Wallum, Griggs Co., N. D.	Farm hand near Wallum during 3 weeks before 1st symptoms.
Thief River Falls, Pennington Co.	Edmore, Ramsey Co., N.D.	Threshing at Edmore during 2 weeks before 1st symptoms.
Anoka, Anoka Co.	Judd, Lamoure Co., N.D..	Lived on claim at Judd during 3 weeks before 1st symptoms.
Mankato, Blue Earth Co..	Grand Forks, Grand Forks Co., N. D.	Concrete worker living in bunk car at Grand Forks; several others ill.
Deer River, Itasca Co.	Hope, Steele Co., N. D. . . .	Harvester at Hope during 3 weeks before 1st symptoms.
Holdingford Twp., Stearns Co.	Mapleton, Cass Co., N. D.	Farmers (2) at Mapleton during 3 weeks before 1st symptoms.
Granite Falls, Chippewa Co.	Minot, Ward Co., N. D. . .	Visited in Minot during 3 weeks before 1st symptoms.
Rochester, Olmsted Co.	Okemah, Okfuskee Co., Okla.	Infected on farm in Oklahoma.
Rochester, Olmsted Co.	Elk Point, Union Co., S.D.	Infected at Elk Point.
Belle Plaine Borough, Scott Co.	Watertown, Codington Co. S. D.	Buying cattle at Watertown during 3 weeks before 1st symptoms.
Austin Twp., Mower Co.	Redfield, Spink Co., S. D.	Resident of Redfield during 3 weeks before 1st symptoms.
Hendricks, Lyon Co.	Brookings Co., S. D.	Present residence, Brookings Co.
Park Rapids, Hubbard Co..	Lily, Day Co., S. D.	Farming near Lily 3 weeks before 1st symptoms.
St. Paul, Ramsey Co.	Greenwood, Clark Co. Wis.	School teacher in Greenwood 3 weeks before 1st symptoms.
Maynard, Chippewa Co.	Warner, Brown Co., S. D..	Domestic at Warner during 3 weeks before 1st symptoms.
Luverne, Rock Co.	Garretson, Minnehaha Co. S. D.	Left Luverne for Garretson.
Minneapolis, Hennepin Co.	Ellsworth, Pierce Co., Wis.	Farming at Ellsworth during 3 weeks before 1st symptoms.
Duluth, St. Louis Co.	Superior, Douglas Co., Wis.	Resident of Superior during 3 weeks before 1st symptoms.
Elmore, Faribault Co.	Cable, Bayfield Co., Wis..	Contact with aunt il with typhoid fever at Cable.
Minneapolis, Hennepin Co.	Eau Claire, Eau Claire Co. Wis.	Photographer in Eau Claire during 3 weeks before 1st symptoms.
Duluth, St. Louis Co.	Ashland, Ashland Co., Wis.	Infected while working on scow at Ashland.

Small Pox

Minnesota Notification	Referred to Health Authority of	Why referred
Minneapolis, Hennepin Co.	Valley Junction, Polk Co. Iowa.	Probably infected at Valley Junction.
Mankato, Blue Earth Co.	Lake Park, Dickinson Co., Iowa.	Contracted small pox from boy visiting from Lake Park.
Minneapolis, Hennepin Co.	Des Moines, Polk Co., Ia..	Evidently infected at Des Moines.
Minneapolis, Hennepin Co.	Waterloo, Black Hawk, Co., Iowa.	At Waterloo Hotel 10-12 days before 1st symptoms.

Small Pox—Continued

Minnesota Notification	Referred to Health Authority of	Why Referred
Columbia Heights, Anoka Co.	Grand Haven, Ottawa Co. Mich.	Went to home in Grand Haven.
St. Paul, Ramsey Co.	Havre, Hill Co., Mont. . . .	Taken ill enroute from Havre.
Vernon Center, Blue Earth Co.	Omaha, Douglas Co., Neb.	Infected by roommate at Omaha.
Minneapolis, Hennepin Co.	Fargo, Cass Co., N. D. . . .	Came from Fargo to Minneapolis.
Rochester, Olmsted Co.	Ackworth, Rolette Co., N. D.	Infected at Ackworth.
Minneapolis, Hennepin Co.	Aberdeen, Brown Co., S. D.	Disease contracted at Aberdeen.
St. Paul, Ramsey Co.	Aberdeen, Brown Co., S. D.	Came from Aberdeen.
Rochester, Olmsted Co.	Scotland, Bonhomme Co., S. D.	Broke quarantine and went to Scotland.
Goodhue, Goodhue Co.	Ellsworth, Pierce Co. Wis.	Evidently infected at Ellsworth.

Scarlet Fever

Minnesota Notification	Referred to Health Authority of	Why Referred
Seeley Twp., Faribault Co.	Kanawha, Hancock Co., Iowa.	Resident of Kanawha.
Litchfield, Meeker Co.	North Dakota.	Came from district about 14 miles from Mandan, Morton Co.
Austin, Mower Co.	Chamberlain, Brule Co., S. D.	Resident of Chamberlain.
Rochester, Olmsted Co.	Canton Twp., Buffalo Co., Wis.	Broke quarantine and went to Canton Twp.
St. Paul, Ramsey Co.	Osceola, Polk Co., Wis. . . .	Taken home to Osceola.

Diphtheria

Minnesota Notification	Referred to Health Authority of	Why Referred
Mora, Kanabec Co.	Schneider, Lake Co., Ind.	Infected at Schneider where sore throat is said to be epidemic.

Measles

Minnesota Notification	Referred to Health Authority of	Why Referred
Rochester, Olmsted Co.	Dalhart, Dallam Co., Tex	Left Rochester without health officer's permission.

In 1914, the water supply of the city of Benson, Minn., was subject to sewage pollution between July 18 and August 12. When this was found out through investigation of typhoid among Benson residents the names, addresses, dates of arrival and departure of all persons registered between these dates at Benson hotels were obtained and forwarded to the proper health authorities.

Among 368 visitors registered at the hotels, 221 were from different places in Minnesota and were followed up by this Division. The others, 147 in number, had given as home addresses 18 different states and 4 Canadian provinces. It is evident that the health authorities of these states and provinces appreciated the warning about the exposed persons since they notified this Division in regard to 96 while 51 could not be traced probably because the addresses given at hotels were not their home addresses.

Cases of Communicable Diseases referred during 1915 to other State or Provincial Health Departments:

Typhoid Fever

Minnesota Notification	Referred to Health Authority of	Why Referred
So. Stillwater, Washington Co.	U. S. P. H. S., Washington, D. C.	Ill in So. Stillwater. Brought from U. S. Steamboat Fury on Mississippi river; had been employed on this boat.
Minneapolis City Hospital, Hennepin Co.	Indiana Harbor, Lake Co., Ind.	Farm hand infected in Indiana.
New Prague, Scott Co.	Fort Dodge, Webster Co., Iowa.	Drank water from Des Moines river about 2 weeks before illness.
Pleasant Mound Twp.	Ia. State Bd. of Health. . .	Ill on arriving in Pleasant Mound Twp. from farm near Iowa City, Johnson Co.
Brainerd, Crow Wing Co. . . .	Fort Dodge, Webster Co., Iowa.	Worked as boilermaker at Fort Dodge during 3 weeks before 1st symptoms.
University Hospital, Minneapolis, Hennepin Co.	Burton, Harvey Co., Kan.	Working on farm at Burton 3 weeks before 1st symptoms.
St. Lucas Hospital, Fairbault, Rice Co.	Malta, Valley Co., Mont.	Ill at St. Lucas Hospital; came from Malta.
Fairview Twp., Lyon Co.	Chinook, Blaine Co., Mont.	Left Chinook when first ill; came home to Fairview.
Crookston, Polk Co.	Grand Forks, Grand Forks Co., N. D.	Employed as nurse in Grand Forks 3 weeks before 1st symptoms.
Minneapolis City Hospital, Hennepin Co.	Morton, Ward Co., N. D.	Farm hand taken ill in No. Dak.
Minneapolis City Hospital, Hennepin Co.	Carrington, Foster Co., N. D.	Thresher 10 miles northwest of Carrington, taken ill there.
St. Raphael Hospital, St. Cloud, Stearns Co.	Hankinson, Richland Co., N. D.	Farm hand infected in N. D.
Hinckley, Pine Co.	Tolley, Renville Co., N. D.	Thresher taken ill in N. D., 3 other cases in same crew.
New Ulm, Brown Co.	Jamestown, Stutsman Co., N. D.	Farm laborer in N. D. during 3 weeks before illness.
Moorhead, Clay Co.	Westhope, Bottineau Co., N. D.	Farm laborer in N. D. during 3 weeks before illness.
Norwegian Lutheran Deaconess Hospital, Minneapolis, Hennepin Co.	Oriska, Barnes Co., N. D.	Working in Oriska 3 weeks before 1st symptoms.
Akeley, Hubbard Co.	Tower City, Cass Co., N. D.	Threshing near Tower City during 3 weeks before 1st symptoms.
Tordenskjold Twp., Otter Tail Co.	Mapes, Nelson Co., N. D.	Farm hand in Mapes during 3 weeks before 1st symptoms.
Lynn Twp., McLeod Co.	Norma, Renville Co., N. D.	Contracted typhoid visiting family (grandparents) in Lynn where typhoid existed.
Mankato, Blue Earth Co. . . .	Sioux Falls, Minnehaha Co., S. D.	Visited brother ill with typhoid in Sioux Falls.
Minneapolis, Hennepin Co.	Aberdeen, Brown Co., S. D.	Taken ill Sept. 27 in Aberdeen.
Minneapolis, Hennepin Co.	Madison, Wis.	Left Minneapolis City Hospital Aug. 10 for Madison, R. F. D. No. 4.
St. Paul, Ramsey Co.	River Falls, Pierce Co., Wis.	Employed as laborer on farm near River Falls during 3 weeks before 1st symptoms.
Hibbing, St. Louis Co.	Rock Springs, Sweetwater Co., Wyo.	Boarded in Rock Springs during 3 weeks before 1st symptoms.

Smallpox

Minnesota Notification	Referred to Health Authority of	Why Referred
Minneapolis Health Department, Hennepin Co.	Star City, Pulaski Co., Ind.; Chicago, Cook Co. Ill.	Taken ill in Star City. Lodged in Chicago
Albert Lea, Freeborn Co.	Ottumwa, Wapello Co., Ia.	Traveling in Iowa while ill with smallpox. Arrived at Albert Lea and was quarantined.
Waterville, Le Sueur Co.	Cherokee, Cherokee Co., Iowa.	Came to Waterville from Cherokee completely broken out with smallpox.
Moorhead, Clay Co.	Fargo, Cass Co., N. D. . . .	Moved from Moorhead to quarantine hospital at Fargo.
Minneapolis Health Department, Hennepin Co.	Minot, Ward Co., N. D. . . .	Fireman Chicago, Minneapolis & St. Paul Railway, headquarters in Minot; ill in Minneapolis.

Smallpox—Continued

Minnesota Notification	Referred to Health Authority of	Why Referred
Minneapolis Health Department, Hennepin Co.	Minot, Ward Co., N. D.	Infected in Minot homestead drawing.
Minneapolis Health Department, Hennepin Co.	Ellendale, Dickey Co., N. D.	Taken ill in North Dakota.
Minneapolis, Hennepin Co.	Elkton, Brookings Co., S. D.	Left Elkton July 4; chickenpox prevalent there. Eruption July 23, Minneapolis.
Minneapolis Health Department, Hennepin Co.	Waubay, Day Co., S. D.	Minneapolis woman exposed while visiting in Waubay.
Hendrum Twp., Norman Co.	Carthage, Miner Co., S. D.	Came direct from Carthage to Hendrum, developed prodromes of smallpox.
Minneapolis, Hennepin Co.	Seattle, King Co., Wash., also U. S. P. H. S.	Taken ill on Great Northern tourist car en route from Seattle.
Minneapolis Health Department, Hennepin Co.	Spring Valley, Pierce Co., Wis., R. F. D. No. 2, (2 cases).	1 case exposed in Minnesota returned to Wisconsin; 1 case exposed in Wisconsin ill in Minneapolis.
N. D. Notification, Devils Lake.	Minneapolis, Hennepin Co., Minn.	Patient transferred from Devils Lake to Minneapolis while ill.

Scarlet Fever

Minnesota Notification	Referred to Health Authority of	Why Referred
Forest Lake Twp., Washington Co.	Superior, Douglas Co., Wis.	Patient broke quarantine at Superior, came to Forest Lake.

Diphtheria

Spring Grove, Houston Co.	Chicago, Cook Co., Ill.	Infected from sister with membranous-vulvovaginitis few days after arrival at Spring Grove from Home-Finding Society of Illinois.
Fish Lake Twp., Co.	Superior, Douglas Co., Wis.	Left Fish Lake for Superior while infectious.

Measles

Delaven, Faribault Co.	Hampton, Franklin Co., Iowa.	Contracted in Hampton where disease is prevalent while visiting uncle; returned to Minnesota.
Minneapolis City Hospital, Hennepin Co.	Bristol, Day Co., S. D., and U. S. Public Health Service.	Taken ill in Bristol (R. F. D. No. 3). Arrived New York City December 12 from London, England.

Aside from these cases of acute infectious diseases there were referred 87 cases of tuberculosis in 1914 and 178 cases in 1915, nearly all advanced "open" cases to the health authorities of the following states and provinces:

1914		1915	
State or Province	Cases	State or Province	Cases
Ontario	1	Manitoba	1
Saskatchewan	1	Quebec	1
Arkansas	1	Saskatchewan (5 places)	5
Colorado	1	California	1
Illinois (3 places)	9	Colorado (2 places)	2
Indiana	1	Illinois (5 places)	6
Iowa (10 places)	10	Indiana	1
Missouri	1	Iowa (35 places)	39
Montana (5 places)	5	Kansas	1
New Mexico	1	Kentucky	1
North Dakota (16 places)	17	Michigan (6 places)	7
Ohio	1	Missouri (10 places)	10
Oregon	1	Montana (11 places)	11
South Dakota (9 places)	11	Nebraska (2 places)	3
Texas	1	New York	1
Vermont	1	North Dakota (20 places)	20
Wisconsin (20 places)	23	Ohio (2 places)	2
Wyoming	1	Oklahoma	1
		Pennsylvania (2 places)	2
		South Dakota (14 places)	16
		Texas (2 places)	2
		Virginia	1
		Washington (3 places)	3
		West Virginia	1
		Wisconsin (34 places)	39

1914: 2 provinces, 17 states, 75 places.

1915: 3 provinces, 22 states, 163 places

Cases Reported in 1914 by Months

Cases reported by death certificate only are not included.

Disease	Total	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Tuberculosis....	3045	244	216	227	235	207	370	309	333	297	268	183	176
Diphtheria....	4683	502	361	441	332	508	357	249	235	226	590	499	370
Scarlet Fever....	6655	809	822	1512	1313	664	300	156	147	185	225	258	277
Typhoid Fever....	1784	102	61	69	59	70	92	121	360	288	310	143	109
Smallpox....	1847	243	220	222	248	246	102	82	66	35	67	113	203
Chickenpox....	711	91	93	96	85	65	34	12	7	17	49	72	70
Measles....	2460	180	235	475	595	422	170	39	14	5	23	210	92
Poliomyelitis....	22	6	1	1	3	1	1	2	1	1	3	2	0
Cerebro spinal meningitis....	21	0	1	9	3	0	2	4	1	1	0	0	0
Trachoma....	34	3	1	4	0	4	1	3	5	5	3	5	0
Trichinosis....	6	0	0	0	0	6	0	0	0	0	0	0	0
Dysentery....	0	0	0	0	0	0	0	0	0	0	0	0	0
Malaria....	0	0	0	0	0	0	0	0	0	0	0	0	0
Ophthalmia neonatorum....	2	0	1	0	0	0	0	0	0	0	0	1	0
Whooping cough	128	1	4	8	8	2	0	6	23	44	4	16	12
Erysipelas....	97	11	11	16	11	8	15	2	5	3	3	4	8
Pellagra....	6	1	0	0	0	1	1	2	0	0	1	0	0
Rabies (human).	2	0	1	1	0	0	0	0	0	0	0	0	0

Cases Reported in 1915 by Months

Cases reported by death certificate only are not included.

Disease	Total	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Tuberculosis....	3559	280	257	424	523	381	404	247	312	252	266	253	260
Diphtheria....	2569	343	231	257	220	170	120	77	142	230	309	264	206
Scarlet Fever....	3801	440	502	527	481	333	236	113	117	149	257	323	323
Typhoid Fever....	994	119	65	78	56	36	42	41	110	147	108	114	78
Smallpox....	1708	325	244	166	176	115	132	49	47	31	51	126	246
Chickenpox....	1457	207	179	125	85	94	105	25	10	32	115	294	186
Measles....	3178	111	160	250	693	743	556	189	45	33	107	63	228
Poliomyelitis....	123	3	1	2	1	0	2	1	28	38	27	17	3
Cerebro spinal meningitis....	25	3	1	4	6	3	2	3	1	0	0	1	1
Trachoma....	20	1	3	3	1	5	2	1	1	1	1	1	0
Trichinosis....	4	0	0	0	0	4	0	0	0	0	0	0	0
Dysentery....	1	0	0	0	0	0	0	0	0	0	1	0	0
Malaria....	1	0	0	0	0	0	0	0	0	0	1	0	0
Ophthalmia Neonatorum....	2	0	0	0	1	0	0	0	0	1	0	0	0
Whooping cough	555	10	5	21	36	52	78	34	56	74	65	82	42
Erysipelas....	107	12	17	14	15	8	10	4	1	1	5	6	14
Pellagra....	1	0	1	0	0	0	0	0	0	0	0	0	0
Leprosy....	1	0	0	0	1	0	0	0	0	0	0	0	0
Rabies (human).	1	0	0	0	0	0	1	0	0	0	0	0	0
Anthrax....	1	0	0	0	0	0	0	0	0	0	1	0	0

Cases Reported in 1914 by Ages

Cases reported by death certificate only are not included.

Disease	Total	Under 1 Year	1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-49	Over 50 Years	Not Given
Tuberculosis...	3045	12	37	45	80	240	490	508	399	276	280	280	398
Diphtheria...	4683	47	501	1095	611	371	363	232	150	75	79	38	1121
Scarlet Fever...	6655	53	774	1551	1025	518	262	142	66	36	28	6	2194
Typhoid Fever...	1784	3	68	125	133	191	251	206	114	108	108	103	374
*Smallpox.....	1847												
Chickenpox.....	711	91	93	96	85	65	34	12	7	17	49	72	90
Measles.....	2460	25	217	433	368	159	70	19	15	7	6	1	1140
*Poliomyelitis...	22												
Cerebro spinal meningitis....	21		4	5	2	2	2	2	1			1	2
Trachoma.....	34			2	1	3	7	2	3	5	3	2	6
Trichinosis....	6		1	2	1						2		
Dysentery.....													
Malaria.....													
Ophthalmia Ne- onatorum....	2	2											
Whooping cough	128	8	18	22	2								78
Erysipelas....	97												97
Pellagra.....	6					1		1		1	2	1	
Rabies (human).	2								1		1		

*See Special Tables for Smallpox and Poliomyelitis.

Cases Reported in 1915 by Ages

Cases reported by death certificate only are not included.

Disease	Total	Under 1 Year	1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-49	Over 50 Years	Not Given
Tuberculosis...	3859	19	47	85	129	235	443	430	349	269	296	257	1300
Diphtheria...	2569	27	386	644	454	260	175	134	74	40	55	24	296
Scarlet Fever...	3801	33	656	1306	896	422	193	77	47	21	24	3	123
Typhoid Fever...	994	1	40	104	87	103	193	143	98	72	81	42	30
*Smallpox.....	1708												
Chickenpox.....	1457	26	164	659	199	37	10	11	7	2	1		341
Measles.....	3178	75	780	1648	284	163	87	42	14	6	12		67
*Poliomyelitis...	123												
Cerebro spinal meningitis....	25	4	6	3	2		4		2	3		1	
Trachoma.....	20		1	2	1		5	2	1	2	4		2
Trichinosis....	4		1	1							2		
Dysentery.....	1												1
Malaria.....	1						1						
Ophthalmia Ne- onatorum....	2	2											
Whooping cough	555	39	202	200	29	3	1		1		2	2	76
Erysipelas....	107	7	3	2	4	4	9	5	11	13	11	29	9
Pellagra.....	1								1				
Leprosy.....	1								1				
Rabies (human).	1		1										
Anthrax.....	1								1				

*See Special Tables for smallpox and poliomyelitis.

Distribution and Sex of Cases Reported in 1914

Cases reported by death certificate only are not included.

County	Tuberculosis			Diphtheria			Scarlet Fever			Typhoid Fever		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
Aitkin	4	2	2	16	10	6	4	2	2	13	7	6
Anoka	13	6	7	34	21	13	65	29	36	9	2	7
Becker	15	8	7	5	3	2	2	2	.....	13	8	5
Beltrami	29	11	18	41	23	18	57	22	35	23	19	4
Bemidji	16	5	11	8	7	1	27	17	10	9	8	1
Benton	5	3	2	4	3	1	12	5	7	1	1	.....
St. Cloud	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Big Stone	4	2	2	1	1	.....	2	.....	2	5	2	3
Blue Earth	61	28	33	16	9	7	35	19	16	13	9	4
Mankato	35	14	21	.....	.....	.....	20	10	10	10	9	1
Brown	18	11	7	31	13	18	19	9	10	99	48	51
New Ulm	8	4	4	24	10	14	3	2	1	62	32	30
Carlton	13	8	5	28	19	9	24	10	14	16	7	9
Cloquet	6	3	3	24	17	7	17	8	9	13	7	6
Carver	5	2	3	16	10	6	17	7	10	3	3	.....
Cass	12	6	6	56	25	31	5	3	2	3	2	1
Chippewa	12	3	9	6	3	3	22	8	14	6	5	1
Chisago	15	8	7	27	12	15	15	4	11	2	2	.....
Clay	16	9	7	20	7	13	16	5	11	2	2	1
Moorhead	8	6	2	7	.....	7	7	2	5	4	3	2
Clearwater	4	2	2	3	2	1	1	.....	1	5	3	2
Cook	1	1	.....	1	.....	1	.....	.....	.....	.....	.....	.....
Cottonwood	8	2	6	4	1	3	5	4	1	15	9	6
Crow Wing	18	11	7	4	2	2	8	5	3	31	24	7
Brainerd	5	4	1	2	1	1	3	3	.....	19	15	4
Dakota	19	16	3	58	30	28	127	54	73	20	15	5
Dodge	6	3	3	14	7	7	5	4	1	6	6	.....
Douglas	19	8	11	3	1	2	10	7	3	10	6	4
Faribault	8	6	2	9	3	6	23	9	14	4	3	1
Fillmore	13	9	4	13	7	6	77	41	36	3	2	1
Freeborn	16	8	8	114	54	60	64	33	31	11	6	5
Albert Lea	14	8	6	95	46	49	29	16	13	9	7	2
Goodhue	25	14	11	13	3	10	82	51	31	13	9	4
Red Wing	9	6	3	6	2	4	94	52	42	5	3	2
Grant	10	4	6	7	5	2	9	3	6	1	1	.....
Hennepin	1085	619	463	2104	1056	1048	1595	819	776	266	174	92
Minneapolis	1076	615	458	2062	1033	1029	1477	768	709	248	166	82
Houston	8	4	4	4	4	.....	49	28	21	.....	.....	.....
Hubbard	3	1	2	5	3	2	27	10	17	5	4	1
Isanti	13	7	6	22	11	11	47	19	28	.....	.....	.....
Itasca	22	12	10	11	5	6	48	26	22	17	11	6
Jackson	2	1	1	9	5	4	36	19	17	29	19	10
Kanabec	14	6	8	12	8	4	32	11	21	3	3	.....
Kandiyohi	18	6	12	107	46	61	10	4	6	3	3	.....
Kittson	5	2	3	.....	.....	.....	.....	.....	.....	5	4	1
Koochiching	7	3	4	9	6	3	29	13	16	17	9	8
Lac qui Parle	10	5	5	11	5	6	21	13	8	6	5	1
Lake	6	3	3	13	3	10	62	35	27	3	3	.....
Le Sueur	7	1	6	6	3	3	10	3	7	4	2	2
Lincoln	4	3	1	2	.....	2	49	25	24	5	2	3
Lyon	9	3	6	3	2	1	27	16	11	11	3	8
McLeod	11	5	6	4	3	1	26	12	14	4	3	1
Mahnomen	1	.....	1	.....	.....	.....	1	1	.....	.....	.....	.....
Marshall	11	6	5	30	12	18	8	1	7	12	10	2
Martin	7	3	4	4	2	2	16	9	7	4	2	2
Meeker	11	5	6	54	16	38	29	15	14	3	3	.....
Mille Lacs	6	2	4	26	14	12	7	3	4	9	3	6
Morrison	10	6	4	6	1	5	11	6	5	6	3	3
Little Falls	2	1	1	1	.....	1	2	1	1	3	1	2
Mower	34	15	19	27	12	15	108	49	59	11	6	5
Austin	17	7	10	1	1	.....	22	7	15	8	5	3
Murray	5	4	1	24	9	15	26	11	15	.....	.....	.....
Nicollet	31	14	17	8	1	7	4	1	3	8	3	5
Nobles	5	2	3	4	2	2	25	10	15	4	2	2
Norman	15	7	8	16	5	11	17	5	12	6	4	2
Olmsted	44	20	24	19	12	7	93	37	56	27	14	13
Rochester	40	18	22	16	8	2	51	19	32	23	13	10
Ottertail	55	26	29	52	31	21	44	29	15	13	6	7
Fergus Falls	5	1	4	30	21	9	29	20	9	13	3	10
Pennington	8	4	4	12	6	6	.....	.....	.....	16	10	6
Pine	17	6	11	14	7	7	10	6	4	5	2	3

Distribution and Sex of Cases Reported in 1914—Continued

Cases reported by death certificate only are not included.

County	Tuberculosis			Diphtheria			Scarlet Fever			Typhoid Fever		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
Pipestone.....	4	1	3	2		2	52	21	31	3	3	
Polk.....	16	8	8	9	4	5	27	8	19	37	22	15
Crookston	1		1	1	1		2		2	14	8	6
Pope.....	20	10	10				5	1	4	10	7	3
Ramsey.....	592			1033			1742			161		
St. Paul	583			989			1687			161		
Red Lake.....	2		2							6	5	1
Redwood.....	7	2	5	17	2	15	33	14	19	13	9	4
Renville.....	13	7	6	11	6	5	27	16	11	8	7	1
Rice.....	52	23	29	71	33	38	28	12	16	100	52	48
Faribault	38	18	20	57	26	31	11	4	7	88	50	38
Rock.....	3	1	2	4	4		2	2		5	2	3
Roseau.....	8	5	3	8	2	6	6	1	5	3	2	1
St. Louis.....	246	170	76	179	82	97	589	284	305	197	138	59
Chisholm	1	1		1		1	25	13	12	2	1	1
Duluth.....	226	156	70	123	55	68	398	189	209	103	70	33
Eveleth.....	6	4	2				27	14	13	2	1	1
Hibbing.....	6	2	4	26	13	13	32	16	16	13	8	5
Stuntz Township				3	2	1	14	9	5	2	1	1
Virginia.....	1	1		3	2	1	44	22	22	29	21	8
Scott.....	8	4	4	5	1	4	52	22	30	23	11	12
Sherburne.....	4		4	5	2	3	7	5	2	2	2	
Sibley.....	8	4	4	23	13	10	17	7	10	1	1	
Stearns.....	23	11	12	47	30	17	98	57	41	7	5	2
St. Cloud	3	2	1	12	9	3	52	30	22	8	3	5
Steele.....	9	5	4	11	7	4	33	18	15	9	6	3
Owatonna	3	3		7	5	2	13	8	5	6	4	2
Stevens.....	6	3	3	30	8	22	1		1	6	4	2
Swift.....	20	9	11	42	23	19				128	68	60
Todd.....	15	8	7	9	5	4	21	6	15	7	7	
Traverse.....	1	1		16	8	8	17	9	8	5	4	1
Wabasha.....	4	1	3	21	10	11	83	47	36	7	4	3
Wadena.....	14	6	8	12	5	7	4	2	2	7	6	1
Waseca.....	7	2	5	3	2	1	20	11	9	2	2	
Washington.....	41	24	17	29	10	19	118	51	67	12	4	8
Stillwater	31	19	12	2		2	69	31	38	12	4	8
Watsonwan.....	7	2	5	2	2		11	5	6	8	3	5
Wilkin.....	4	4		1		1	26	13	13	1		1
Winona.....	42	23	19	25	9	16	202	104	98	9	4	5
Winona	28	19	9	17	8	9	141	70	71	5	2	3
Wright.....	36	7	19	47	22	25	54	27	27	11	8	3
Yellow Medicine.....	12	7	5	4		4	17	6	11	28	22	6

Distribution and Sex of Cases Reported in 1915

County	Tuberculosis			Diphtheria			Scarlet Fever			Typhoid Fever		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
Aitkin.....	7	3	4	2	1	1	..	..	..	7	3	4
Anoka.....	18	3	15	1	1	..	..	1	1	3	..	3
Becker.....	9	5	4	4	..	..	4	5	3	2	9	6
Beltrami.....	21	5	16	26	12	14	34	19	15	4	4	..
Bemidji.....	13	4	9	26	12	14	17	9	8	3	3	..
Benton.....	8	4	4	1	..	..	11	6	5	..	..	..
St. Cloud.....	..	..	..	..	..	..	4	3	1	..	..	..
Big Stone.....	4	1	3	2	1	1	1	1	..	6	4	2
Blue Earth.....	23	11	12	14	6	8	107	53	54	11	8	3
Mankato.....	13	6	7	7	2	5	85	42	43	5	4	1
Brown.....	19	11	8	6	3	3	15	6	9	14	11	3
New Ulm.....	2	2	..	4	2	2	7	4	3	12	9	3
Carlton.....	13	8	5	6	2	4	51	20	31	3	1	2
Cloquet.....	9	8	1	5	1	4	25	15	10	2	1	1
Carver.....	10	5	5	3	2	1	..	..	..	2	1	1
Cass.....	18	6	12	7	3	4	7	2	5	2	2	..
Chippewa.....	14	4	10	6	4	2	23	10	13	5	3	2
Chisago.....	15	7	8	7	5	2	5	3	2	2	1	1
Clay.....	13	8	5	70	40	30	56	27	29	6	4	2
Moorhead.....	5	4	1	15	6	9	10	5	5	4	3	1
Clearwater.....	6	1	5	2	..	..	1	..	1	..	..	..
Cook.....	..	..	..	..	..	..	..	..	..	..	..	..
Cottonwood.....	12	5	7	2	2	..	15	5	10	9	4	5
Crow Wing.....	22	17	5	5	3	2	17	6	11	14	11	3
Brainerd.....	13	9	4	3	2	1	8	1	7	9	7	2
Dakota.....	14	11	3	50	23	27	43	14	29	14	7	7
Dodge.....	10	5	5	1	..	..	22	8	14	3	1	2
Douglas.....	15	11	4	..	..	..	15	7	8	4	3	1
Faribault.....	16	7	9	..	..	..	18	11	7	1	1	..
Fillmore.....	16	5	11	15	10	5	13	4	9	2	1	1
Freeborn.....	16	6	10	24	10	14	12	4	8	25	16	9
Albert Lea.....	6	2	4	20	8	12	5	2	3	21	12	9
Goodhue.....	26	16	10	19	9	10	11	6	5	15	10	5
Red Wing.....	..	..	..	15	7	8	..	..	..	8	5	3
Grant.....	4	1	3	7	3	4	5	1	4	..	..	..
Hennepin.....	1300	720	580	1061	508	553	504	246	258	172	122	50
Minneapolis.....	1275	706	569	1046	590	546	463	228	235	166	119	47
Houston.....	7	5	2	5	4	1	11	5	6	..	..	..
Hubbard.....	4	..	4	..	..	..	7	4	3	5	3	2
Isanti.....	11	4	7	29	11	18	9	4	5	2	..	2
Itasca.....	27	20	7	28	12	16	38	18	20	4	3	1
Jackson.....	3	3	..	4	1	3	76	28	48	16	10	6
Kanabec.....	4	1	3	2	1	1	..	..	..	1	1	..
Kandiyohi.....	16	6	10	10	5	5	8	5	3	1	1	..
Kittson.....	6	1	5	1	1	..	3	..	3	7	4	3
Koochiching.....	10	7	3	..	..	..	34	13	21	7	7	..
Lac qui Parle.....	4	1	3	4	2	2	7	2	5	..	..	..
Lake.....	4	..	4	2	2	..	16	11	5	3	2	1
Two Harbors.....	4	..	4	1	1	..	16	11	5	3	2	1
Le Sueur.....	17	9	8	6	6	..	2	..	2	5	3	2
Lincoln.....	3	..	3	3	1	2	33	13	20	2	1	1
Lyon.....	15	4	11	16	5	11	28	11	17	5	3	2
McLeod.....	4	3	1	2	..	..	3	2	1	6	2	4
Mahnomen.....	1	..	1	..	..	..	..	..	..	..	..	..
Marshall.....	13	8	5	17	7	10	10	3	7	7	7	5
Martin.....	12	4	8	29	9	20	13	4	9	11	7	4
Meeker.....	16	10	6	36	18	18	11	4	7	2	1	1
Mill Lake.....	8	5	3	29	8	21	3	1	2	6	3	3
Morrison.....	8	4	4	2	..	..	25	9	16	1	1	..
Little Falls.....	4	2	2	1	1	..	3	1	2	1	1	..
Mower.....	23	14	9	94	47	47	30	13	17	10	7	3
Austin.....	13	9	4	93	46	47	10	4	6	8	6	2
Murray.....	6	3	3	..	..	..	1	1	2	2	2	..
Nicollet.....	14	7	7	11	1	10	43	19	24	4	3	1
Nobles.....	7	1	6	6	1	5	7	1	6	9	6	3
Norman.....	14	7	7	16	6	10	4	1	3	9	5	4
Olusted.....	37	21	16	3	2	1	45	14	31	13	7	6
Rochester.....	34	21	13	2	1	1	23	9	14	8	3	5
Otter Tail.....	81	13	15	30	15	15	56	28	28	17	14	3
Fergus Falls.....	3	2	1	6	2	4	..	..	..	13	10	3
Pennington.....	9	3	6	7	3	4	..	..	..	5	3	2
Pine.....	104	11	3	4	3	1	8	3	5	5	4	1

Distribution and Sex of Cases Reported in 1915—Continued

County	Tuberculosis			Diphtheria			Scarlet Fever			Typhoid Fever		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
Pipestone.....	4	3	1				48	18	30	1	1	
Polk.....	35	19	16	4	1	3	20	8	12	16	8	8
Crookston.....	9	4	5	1	1		13	4	9	9	5	4
Pope.....	10	6	13	2	2		26	13	13	6	6	
Ramsey.....	730	66	39	480	223	257	873	414	459	159	79	80
St. Paul.....	725	64	36	476	222	254	851	398	453	154	75	79
Red Lake.....	2	1	1							9	6	3
Redwood.....	11	8	3	4	1	3	38	22	16	8	4	4
Renville.....	12	7	5	2	1	1	31	18	13	3	2	1
Rice.....	13	7	6	11	5	6	39	16	23	43	31	12
Faribault.....	5	4	1	3	1	2	26	3	17	32	23	9
Rock.....	8	6	2	2	2		22	12	10	6	4	2
Roseau.....	17	9	8	8	5	3	2		2	7	4	3
St. Louis.....	464	150	78	93	45	48	592	283	309	134	95	39
Chisholm.....	16	9	7	4	1	3	1	1	3	3		3
Duluth.....	215	63	32	74	38	36	435	215	220	57	40	17
Eveleth.....	9	4	5				4	2	2	4	3	1
Hibbing.....	23	18	5	7	2	5	106	41	65	9	7	2
Stuntz Township.....	2	1	1	2		2	1	1				
Virginia.....	15	10	5	1	1		8	4	4	22	15	7
Scott.....	12	7	5	8	5	3	15	7	8	8	8	1
Sherburne.....	3	3		8	3	5	16	3	13	1		1
Sibley.....	12	9	3	12	3	9	5	2	3	5	2	3
Stearns.....	26	10	16	82	42	40	103	51	52	22	11	11
St. Cloud.....	7	2	5	22	9	13	29	15	14	8	3	5
Steele.....	4	3	1	7	5	2	39	20	19	5	5	
Owatonna.....	1		1	5	3	2	10	6	4	3	3	
Stevens.....	3	2	1	17	9	8				1	1	
Swift.....	11	4	7	29	13	16	30	18	12	6	4	2
Todd.....	10	5	5	7	3	4	57	25	32	2	2	
Traverse.....	4	4		4	1	3	3		3			
Wabasha.....	11	5	6	3	2	1	30	17	13	9	6	3
Wadena.....	12	6	6	5	4	1	13	6	7	1	1	
Waseca.....	8	4	4	3	1	2	8	5	3			
Washington.....	41	32	9	10	7	3	40	13	27	10	8	2
Stillwater.....	7	4	3	2	2	2	2	2	2	2	1	1
Watsonwan.....	11	4	7	3	1	2	10	4	6			
Wilkin.....	2	1	1				28	9	19	6	2	4
Winona.....	23	15	8	15	10	5	24	8	16	13	7	6
Winona.....	22	14	8	13	8	5	15	6	9	13	7	6
Wright.....	29	15	14	9	5	4	122	50	72	6	3	3
Yellow Medicine.....	7	3	4	4	2	2	43	19	24	9	5	4
Non-residents.....	178											

NOTE—Sex not given for all cases.

Non-resident cases under treatment in Minnesota were referred to health authorities of home territory upon leaving here. (See Reciprocal Notification list).

Distribution of Cases Reported in 1914 and 1915

County	Smallpox		Chickenpox		Measles		Whooping Cough		Trachoma		C. S. Meningitis	
	1914	1915	1914	1915	1914	1915	1914	1915	1914	1915	1914	1915
Aitkin...	17	1		1	36	2						
Anoka	28	4	11	3	2							
Becker		9		1	2	32						
Beltrami	33	3	3	5					2	1		1
Benton	2	4	2	2	7							1
Big Stone		20				1						
Blue Earth	60	115	1	16	3	4		9				
Brown	36	57			17	16		1			1	1
Carlton	105	25	5	12	52	1		3				
Carver	6	1			27	16						
Cass	35	5			13	5						
Chippewa	23	22	2	2	1	81				1		
Chisago	2	1		17	4	6						
Clay		6	5	6		9	11		1		1	1
Clearwater	8											
Cook												
Cottonwood	40	13				1		1				
Crow Wing	28	11		1	12	23						
Dakota	2	5	6	10	30	125		16	2	1		
Dodge	7	2		2	17	37		1				
Douglas	25	8				58						
Faribault	2	52		3		4				1		
Fillmore	14	2	2	1	195	15						
Freeborn	3	26				18		1				
Goodhue	6	15	10	4	29	11			1			
Grant	1	1										
Hennepin	139	171		285	496	765		49			2	3
Minneapolis	139	140		282	479	639		49			2	3
Houston		5			88	8						
Hubbard	3	2		1	2	2	31				1	
Isanti	2	38	4	6	10	6						1
Itasca	19	3	14	17	13				1			
Jackson	17	39		2		7						
Kanabec	1				15	1						
Kandiyohi	17	3	2		23	7						
Kittson	10											
Koochiching	9	1			5							
Lac qui Parle	5	1	2		68	1						
Lake		5			3							
Le Sueur	7	31				3						
Lincoln	7	27		11	3	13		2				
Lyon	8	38	6	13		5		2				
McLeod	28	8	2			82		2				
Mahnomen					1							
Marshall	39					2						1
Martin	79	42	3		1			21				
Meeker	2	8			62	26						
Mille Lacs	4				11	36						
Morrison	3		4	2	8	3		2			1	
Mower	11	2	9	54	23	15	6					1
Murray	43	33	1		7	3						
Nicollet	5	12	3		3	69						
Nobles	41	42		2		1		2				1
Norman	5	7				2						1
Olmsted	62	18	26	54	12	39	2	57			1	1
Otter Tail	9	12	2	4	1	21						
Pennington	35					38						
Pine	5	10			25	7						
Pipestone	39	40	2			6			1			
Polk	73	55	2		2	1						2
Pope	14	15	2									
Ramsey	60	122	257	429	560	1234	29	128	6			1
St. Paul	60	248	416	560	1216	29	128	6				
Red Lake	2		1			2		3				
Redwood	26	127	1		120	4						
Renville	8	20			14	5						
Rice	16	19	22	62	12	18			2			
Rock	24	20				13						
Roseau				2		9						
St. Louis	226	46	248	370	147	59	21	230	18	16	5	7
Duluth	157		191	278	116	36	21	137	7	5	5	6
Scott	1	21			1	7						

Distribution of Cases Reported in 1914 and 1915—Continued

County	Smallpox		Chickenpox		Measles		Whooping Cough		Trachoma		C. S. Meningitis	
	1914	1915	1914	1915	1914	1915	1914	1915	1914	1915	1914	1915
Sherburne.....	25	1										
Sibley.....		43	1		31	5						
Stearns.....	26	52		1	2	1					8	2
Steele.....	11	15	8	33		62	7	20				
Stevens.....	6											
Swift.....	45	17	1		4	1						
Todd.....	5	54	4		6	2		2				
Traverse.....		1	1		2							
Wabasha.....		19		7	13	35						
Wadena.....	13	3		1								
Waseca.....		3	1			3						
Washington.....	6	11	5	8	28	80					1	
Watsonwan.....	20	12				1						
Wilkin.....	36	2	1	4	2	3		1				
Winona.....		21	3		4	2						
Wright.....	50	13	15	3	1	1	9	1				
Yellow Medicine.....	14	6	1		27	1						
Total.....	1847	1708	711	1457	2460	3178	128	555	34	20	21	25

Cases reported by death certificate only, not included.

PASTEUR INSTITUTE.

The Pasteur Institute, since its establishment August 1, 1907, has been in charge of Dr. O. McDaniel, and the work of the institute consists of:

1. Diagnosis of rabies.
2. Preparation of antirabic vaccine for the Pasteur treatment.
3. Administration of the Pasteur preventive treatment.
4. Consultation and advice as to the giving or withholding of the antirabic treatment.

A description of the methods used in this institute and a digest on rabies, including directions for the preparation and shipment of specimens, were prepared by Dr. O. McDaniel and incorporated in the fifth biennial report. This material has been embodied in a circular on rabies, which has been published as a bulletin of the State Board of Health and freely distributed.

RABIES EXAMINATIONS.

During the biennial period ending December 31, 1915, the heads, or portions of the central nervous systems, of 74 animals—65 dogs, 6 cats, 1 cow, 1 raccoon and 1 guinea pig—were received for examination. In addition, examinations were made of portions of the central nervous systems of two human beings who died of rabies.

Rabies was diagnosed in but 10 specimens from lower animals received during 1914, and in 1 human case investigated. The 11 positive cases were sent from 10 different sanitary districts in 6 counties.

Sanitary Districts Giving Positive Rabies Cases During 1914

1	St. Paul.....	Ramsey Co.....	1
2	North St. Paul.....	Ramsey Co.....	1
3	So. St. Paul.....	Washington Co.....	1
4	Inver Grove Village.....	Dakota Co.....	2
5	Inver Grove Township.....	Dakota Co.....	1
6	Hastings.....	Dakota Co.....	1
7	Randolph.....	Dakota Co.....	1
8	New Prague City.....	Le Sueur Co.....	1
9	Albert Lea.....	Freeborn Co.....	1
10	Levin Township.....	Pope Co.....	1

One death from rabies was investigated as follows:

Mrs. M. of county, Minn., died 52 days after she had been bitten by a rabid dog. No history of possible rabies exposure was given to the physician in attendance. The attending physician and a consultant made no satisfactory diagnosis of the case prior to death. A few days later a relative of the patient, recalling the circumstances of Mrs. M.'s receiving a wound from a dog, informed the attending physician of this fact. The physician at once had the dog removed from the ground and shipped to this department, together with a statement of the case. The dog had been buried about December 20. The head was received in the laboratory February 27, and on the following day a diagnosis of rabies, based upon the finding of Negri bodies, was returned.

A brief outline of the clinical course of the case as follows was obtained from the attending physician:

Mrs. M. received from the tooth of the family dog a slight scratch upon her wrist about December 20, 1913. The dog was ill at the time and presented symptoms of rabies. The dog rapidly weakened and when nearly dead, about two days later, Mr. M. very humanely chloroformed him. Since the scratch which Mrs. M. received did not draw blood, and since the dog was at no time violent, the whole matter was forgotten by the family until some days after Mrs. M. was buried.

About January 20, 1914, Mrs. M. fell and hurt her right wrist quite severely. The wrist was not seriously hurt, however, for after a couple of days it no longer troubled her.

About two weeks later, on February 5, Mrs. M. complained of pain and a burning sensation in her right wrist which extended up the right arm. On the evening of the 7th, Mrs. M. again complained of such pain and sensations while

cutting a cake. The pain continued and increased during the evening and through the night of the 7th and Mrs. M. was restless and unable to sleep. Mrs. M. ate nothing after 2:00 A. M. the morning of the 8th, when she had a luncheon.

A physician was first called on Monday morning, February 9. Mrs. M. drank the medicine at first but later in the day was unable to swallow it. On this day she complained that the splash from a teaspoon in a glass of water and that from washing one's hands gave her a sensation of "smothering," and at the same time she is said to have had the characteristic spasm of the inspiratory muscles.

On the following day, February 10, Mrs. M. again drank her medicine about 11:00 A. M. and again in the afternoon when two physicians were present. Any slight movement of the bed clothes or of a person moving near the bed, etc., brought on the "smothering" feeling with its attendant spasm of the inspiratory muscles. There was much thick tenacious mucus in the mouth and Mrs. M. had great difficulty in raising it. Her movements were described as jerky. Her eyes appeared large and she had a "look of great mental anxiety." She became very weak during the latter part of the day and died as she attempted to sit up in bed at 9:45 P. M., February 10.

During 1915 there were received from Minnesota for examination 26 specimens from lower animals suspected of having rabies. One specimen was received from New Richmond, Wis. In but one instance was rabies diagnosed. This case was that of a dog which bit two children in Vasa township, Goodhue county.

An examination of one human case, Pasteur No. 1290, which developed symptoms while under treatment, was made. The report of this case is given under Pasteur Cases on page 142.

TABLE A—An Analysis of Rabies Examinations in 1914 and 1915

	Positive	Negative	Unsatisfactory
1. Negri bodies + Animal inoc. +.....	3*		
2. Negri bodies + Animal inoc. not made.....	6		
3. Negri bodies — Animal inoc. +.....	4*		
4. Negri bodies — Animal inoc. —.....		52	
5. Negri bodies — Animal inoc. not made.....		1	
6. Negri bodies not looked for; animal inoc. —.....		3	
7. Negri bodies not looked for; animal inoc. unsatisfactory.....			1
8. No examination possible.....			6
Total.....	13	56	7

*—One human case included.

Note:

Under 3. Material badly decomposed in two cases.

Under 5. The dog had been run over by an automobile and received extensive internal injuries which resulted in death a few minutes after injury.

Under 6. Material badly decomposed.

Under 7. Material badly decomposed, animals died of meningitis.

TABLE B—An Analysis of Rabies Examinations by Months

	1914		1915		Total Positive	Total Suspected
	Positive	Suspected	Positive	Suspected		
January.....	1	3	0	1	2	4
February.....	1	2	0	0	1	2
March.....	1*	4	0	4	1	8
April.....	2	7	0	3	2	10
May.....	3	7	1	4	4	11
June.....	2	7	1*	5	3	12
July.....	0	8	0	2	0	10
August.....	1	4	0	2	1	6
September.....	0	4	0	3	0	7
October.....	0	1	0	2	0	3
November.....	0	1	0	1	0	2
December.....	0	1	0	0	0	1
Total.....	11	49	2	27	14	76

*—One human case included.

PASTEUR CASES.

During the two years ending December 31, 1915, 116 persons were registered for the preventive treatment of rabies. Eighty-six lower animals, 74 dogs, 12 cats, and 1 human being were implicated in infecting these persons.

There were 74 persons registered during 1914, 73 of whom came from 20 sanitary districts in 11 counties in Minnesota, and one came from without the state.

List of Sanitary Districts Giving Number of Treated Persons from Each for Year 1914

1. Minneapolis	Hennepin Co.	38
2. Edina Village	Hennepin Co.	1
3. St. Paul	Ramsey Co.	3
4. Rose Township	Ramsey Co.	1
5. North St. Paul Village	Ramsey Co.	6
6. Denmark Township	Washington Co.	1
7. Invergrove Village	Dakota Co.	2
8. Invergrove Township	Dakota Co.	5
9. Hastings	Dakota Co.	1
10. Randolph Township	Dakota Co.	1
11. Mabel Village	Fillmore Co.	2
12. Newberg Township	Fillmore Co.	2
13. Blakely Township	Scott Co.	1
14. Stately Township	Brown Co.	1
15. Brighton Township	Nicollet Co.	1
16. Albert Lea	Freeborn Co.	2
17. Janesville Township	Waseca Co.	1
18. Vivian Township	Waseca Co.	1
19. Biwabik Village	St. Louis Co.	3
Helena, Ark.		1

The 42 persons who were registered during 1915 came from 12 sanitary districts in 11 counties in Minnesota.

List of Sanitary Districts Giving Number of Treated Persons from Each for Year 1915

1. Minneapolis	Hennepin Co.	18
2. St. Paul	Ramsey Co.	10
3. New Brighton Village	Ramsey Co.	2
4. Vasa Township	Goodhue Co.	2
5. Hammond Village	Wabasha Co.	1
6. Delafield Township	Jackson Co.	1
7. Waverly Village	Wright Co.	1
8. Sandstone Village	Pine Co.	2
9. Cambridge Village	Isanti Co.	1
10. Hebron Township	Aitkin Co.	1
11. Arago Township	Hubbard Co.	2
12. Stephen Village	Marshall Co.	1

An analysis of the 116 cases treated is given in Tables C and D.

Class I includes persons bitten or otherwise infected by animals proven to have had rabies.

Class II includes persons bitten or otherwise infected by animals in which a diagnosis of rabies was based upon clinical grounds.

Class III includes persons bitten or otherwise possibly infected by animals merely suspected of having rabies.

Under "Bitten" and "Otherwise infected" all three classes are redivided into those frankly bitten and those in whom the atrium of infection was caused in some other way than by the teeth of the offending animal. Each of these divisions is again subdivided according to the location of the injury upon the body.

TABLE C—An Analysis of Cases Treated During Year 1914

	Bitten			Otherwise Infected			Total
	Head	Hands	Other Parts	Head	Hands	Other Parts	
Class I.....	2	5	10	1	8	4	30
Class II.....	0	0	2	1	2	1	6
Class III.....	11	*5	*21	0	1	0	38
Total.....	13	10	33	2	11	5	74

*—Two persons discontinued treatment for the reason that the offending dog was traced and rabies excluded.

Note to Table C. The examinations of 9 animals infecting 16 persons were made in other laboratories as follows: 8 in the City Board of Health Laboratory, Minneapolis, and 1 in the City Board of Health Laboratory, St. Paul.

There were 30 persons in whom the infecting animal was proven to have had rabies as included under Class I. Six persons were bitten or infected by animals in which a clinical diagnosis was made (Class II) and 37 persons were bitten or possibly infected by animals suspected of having rabies (Class III). In 12 persons in Class III the offending animal was proven not to have had rabies through laboratory examination. In the remaining 25 cases belonging to Class III the dog escaped, was not traced or was killed and the head not sent for examination.

No deaths in persons treated during 1914 occurred. One death occurred on March 13, 1914, in a person (Case 1177) treated in August-September, 1913. F. M. G., St. Paul, was bitten on August 15 by his own pet dog, in which a diagnosis of rabies was given by Dr. C. E. Cotton, Minneapolis. Patient underwent the full ordinary course of treatment which was begun on August 18 and ended September 7.

On the evening of Monday, March 9, 1914, Mr. G. spoke of not feeling well but he continued to go about his business until noontime of the following Wednesday, March 11, when he returned to his home. After sleeping about two hours he got up and began to get ready to go to see a physician. Before starting for the physician's office he attempted to drink some water and found he could not drink it.

He reached the office of Dr. F. E. Cobb, Merriam Park, St. Paul, about 4:00 P. M., March 11. He complained of feeling tired and nervous. Dr. Cobb sprayed his throat, gave him a sedative and after a short rest Mr. G. went home. At 7:00 P. M. Dr. Cobb was called to the house, since Mr. G.'s nervousness had increased. At this time Dr. Cobb noticed the spasm of the inspiratory muscles and soon stated that the symptoms suggested rabies to him. He was then informed that Mr. G. had been bitten about 9 months previously.

At 9:00 A. M. Thursday, March 12, Dr. Cobb's diagnosis was confirmed by Dr. A. S. Hamilton, Professor of Nervous Diseases, University of Minnesota, and by Dr. O. McDaniel. At this time patient was very nervous and moved and talked incessantly. The spasm of the inspiratory muscles was very marked and was easily stimulated by draughts of air from moving the bedclothes, by talking and by attempting to drink water. The nervous symptoms increased in intensity in spite of one-half grain doses of morphine hypodermically at 5:00 P. M., 7:00 P. M., and 9:00 P. M. until about 9:30 P. M., when the patient had to be overpowered as he attempted to get up and go out. Chloroform was given at this time and had to be kept up until after midnight. Death occurred at 4:40 A. M., March 13.

TABLE D—An Analysis of Cases Treated During Year 1915

	Bitten			Otherwise Infected			Total
	Head	Hands	Other Parts	Head	Hands	Other Parts	
Class I.....	3	2	2	0	0	0	7
Class II.....	0	0	0	0	0	0	0
Class III.....	7	*17	10	1	0	0	35
Total.....	10	19	12	1	0	0	42

*—Treatment was discontinued in 2 persons since the offending animal was traced and found to be normal.

Note to Table D. The examinations of 9 animals which bit 9 persons were made in the City Board of Health Laboratory, Minneapolis, and of 2 animals which bit 2 persons in the City Board of Health Laboratory, St. Paul.

There were but 7 persons treated during the year in which the offending animal was proven to be rabid. No persons were treated who were bitten by animals in which an unconfirmed clinical diagnosis of rabies was given. Thirty-five persons were bitten by animals suspected of having rabies. In 11 of these persons it is certain that treatment was unnecessarily given, since through the inoculation of rabbits the offending animal was proven not to have rabies.

During 1915 one patient developed rabies while undergoing treatment.

Case No. 1290, C. A., male, aged 5, was bitten May 12 by a rabid dog (Rabies Case No. 743). There were multiple wounds about both eyes, in front and behind the left ear and upon the left ear itself.

Treatment was begun on May 15. First symptoms of rabies developed on May 29, the 17th day following date of biting. Toward evening May 29, the child became noticeably irritable. He was restless during the night and at midnight awakened and vomited and was feverish. May 30, vomited a number of times, refused food and though quiet, did not sleep either during the day or through the night.

May 31: Child was apprehensive, had fever, was flushed and was very restless. The characteristic spasm of the inspiratory muscles was well marked. Restlessness continued and increased until late in the evening of June 1, when he became quiet and remained so until death, which took place at 4:30 A. M., June 2. (For results of examination, see page 139.)

Besides the treated persons 214 others applied for advice, but were not treated.

TABLE E—An Analysis of All Applicants by Months

	1914 Treated			1914 Not Treated	1915 Treated			1915 Not Treated	Total Applicants During Biennial Period
	Class I and II	Class III	Total		Class I and II	Class III	Total		
January.....	0	1	1	4	1	0	1	3	9
February.....	0	2	2	1	0	0	0	5	8
March.....	2	4	6	15	0	5	5	1	27
April.....	9	0	9	12	0	1	1	8	30
May.....	5	3	8	10	4	2	6	9	33
June.....	1	7	8	19	0	5	5	20	52
July.....	12	7	19	22	0	10	10	16	67
August.....	0	4	4	14	0	0	0	15	33
September.....	0	4	4	11	0	4	4	5	24
October.....	6	3	9	4	1	2	3	6	22
November.....	1	3	4	6	1	4	5	4	19
December.....	0	0	0	0	0	2	2	4	6
Total.....	36	38	74	118	7	35	42	96	330

MAIN AND BRANCH LABORATORIES.

The work in the laboratories of the Division of Preventable Diseases has consisted of the usual examinations made in public health laboratories. During the biennial period—January 1, 1914, to December 31, 1915—61,734

such examinations have been made in the Main Laboratory (in charge of Miss E. M. Wade, M. A.), 11,020 in the Duluth Branch Laboratory (in charge of Dr. T. R. Martin), and 2,162 in the Mankato Branch Laboratory (in charge of Dr. C. C. Pratt), as shown in Table I.

This shows an increase of 36 per cent over the preceding biennial period in number of examinations, but if the nature of the examination is taken into consideration, the actual increase in work is much greater than this. It must also be borne in mind that the Main Laboratory was closed during two and one-half months in 1915 because of lack of funds. In addition to this work, there have been made in the Duluth Branch 2,608 examinations, of which 1,206 were of water, 1,361 of milk, 29 of hypochlorite and 12 of ice. These examinations have been made for the Division of Sanitation and the results of the examinations reported to that Division. During the preceding biennial period, 1,817 such examinations were made, of which 1,016 were of water and 801 of milk.

MAIN LABORATORY.

The examinations by months during the two years in the Main Laboratory are given in Tables II and III. From May 15 to August 1, 1915, no routine examinations were made with the exception of a few cultures from persons admitted to the University Hospital. In addition to these routine examinations, 8,420 special Widal tests were made in 1914 and 951 in 1915. These were made in connection with two different studies: one on the Widal reaction before, during and after immunization with typhoid vaccine, and the other on the Widal reaction in tuberculous persons.

TABLE I
Total Examinations During the Biennial Period

	Diphtheria	Tuberculosis	Typhoid Blood Tests	Diphtheria Virulence Tests	Tuberculosis Animal Tests	Typhoid Isolations	Menin-gococci	Miscel-laneous	Special Widals	Total
Main 1914.....	23,761	2,004	3,023	220	19	293	19	30	8,420	37,789
Main, 1915.....	19,378	1,735	1,446	192	26	151	12	54	951	23,945
Duluth, 1914.....	4,609	830	540	.....	.....	.....	.....	0	27	6,006
Duluth, 1915.....	3,727	846	411	.....	.....	.....	.....	1	29	5,014
Mankato, 1914.....	657	237	160	.....	.....	.....	.....	3	.....	1,057
Mankato, 1915.....	744	232	119	.....	1	.....	.....	9	.....	1,057
Total.....	52,876	5,884	5,699	412	46	444	31	97	9,427	74,916
Previous Biennial Period.....	40,698	4,522	4,147	74	12	0	23	54	5,542	55,072

TABLE II
Routine Examinations by Months in Main Laboratory, 1914

1914	Diph-theria	Tuber-culosis	Typhoid Blood Tests	Virulence Tests	Tuber-culosis Animal Tests	Typhoid Isolations	Menin-gococci	Miscel-laneous	Total
January...	1,396	171	143	28	5	0	0	0	1,743
February..	2,641	129	159	25	3	0	2	1	2,960
March.....	2,907	114	158	23	0	2	7	0	3,211
April.....	1,714	161	310	21	0	5	5	0	2,216
May.....	2,180	202	120	10	2	17	4	0	2,535
June.....	1,511	170	161	20	3	12	0	2	1,879
July.....	944	182	197	11	0	23	0	1	1,358
August...	820	154	436	7	1	11	0	4	1,433
September	1,709	116	337	9	2	15	0	16	2,204
October...	3,338	163	343	12	0	114	0	3	3,973
November.	2,101	150	341	30	1	52	1	1	2,677
December.	2,500	292	318	24	2	42	0	2	3,180
Total.	23,761	2,004	3,023	220	19	293	19	30	29,369

TABLE III
Routine Examinations by Months in Main Laboratory, 1915

1915	Diphtheria	Tuberculosis	Typhoid Blood Tests	Virulence Tests	Tuberculosis Animal Tests	Typhoid Isolations	Menigococci	Miscellaneous	Total
January...	2,452	200	184	31	0	10	2	2	2,881
February...	1,950	193	156	26	4	27	2	5	2,363
March....	1,714	260	189	24	1	17	3	4	2,212
April.....	1,116	310	147	21	4	8	0	2	1,608
May.....	604	109	65	8	2	46	0	5	839
June.....	164	0	0	0	0	0	0	0	164
July.....	172	0	0	0	0	0	0	0	172
August....	649	119	120	6	0	2	0	1	897
September	3,140	129	138	7	5	6	3	5	3,433
October...	2,858	142	139	20	6	10	1	3	3,179
November...	3,037	131	164	31	4	18	1	21	3,407
December.	1,522	142	144	18	0	7	0	6	1,839
Total.	19,378	1,735	1,446	192	26	151	12	54	22,994

DIPHTHERIA.

Of the 23,761 specimens examined for diphtheria bacilli in 1914, 14,154 were for diagnosis and 9,607 for release from quarantine.

In 1915, of the 19,378 specimens, 13,462 were for diagnosis and 5,916 for release.

These specimens represent 9,874 cases in 1914 and 9,694 cases in 1915. The results of these examinations, together with the number of counties and sanitary districts represented, are given in Table IV.

TABLE IV
Cases Examined During Biennial Period and Localities Represented

Year	Positive	Negative	Reserved	Total	Counties	Sanitary Districts
1914.....	1,066	8,512	296	9,874	80	520
1915.....	646	8,919	129	9,694	75	424

Of these positive cases 664, or 62.3 per cent, in 1914, and 428, or 66.3 per cent, in 1915, were released on laboratory findings, either by two successive negative examinations, or on a negative virulence test. The average duration in days of these cases from date of first symptoms to date of second negative culture is shown in Table V.

The cases are divided into 5 groups: (a) clinical cases with positive laboratory findings and released on two negatives; (b) clinical cases in

TABLE V
Average Duration in Days of Cases Released by Laboratory Examination

Year	Clinical Cases						Non-Clinical Cases				Total	
	(a) Culture Pos.		(b) Culture Neg.		(c) No Diagnosis Culture		(d) Released on 2 Neg.		(e) Released on Virulence Test			
	No. Cases	Duration	No. Cases	Duration	No. Cases	Duration	No. Cases	Duration	No. Cases	Duration	No. Cases	Av. Duration
1914....	490	40.2	35	15.	63	27.	72	22.6	4	40.2	664	35.8
1915....	276	35.4	10	16.5	56	26.5	68	27.	18	22.	428	31.9

which the specimens for diagnosis were negative and the cases were released on two negatives; (c) clinical cases in which no specimens were sent for diagnosis, but two successive negative release cultures were obtained; (d) non-clinical cases released on two negatives; and (e) non-clinical cases released on negative virulence tests.

If there are omitted from group (a) in 1914, 22 cases, each running over 90 days and averaging over 124 days, the average duration of the remaining 468 cases is reduced to 36.2 days and if for the year 1915, 3 cases running over 90 days are omitted from group (a), the average duration of the remaining 273 cases is 33.9 days. It is to be expected that the average duration of diphtheria bacilli in the upper air passages will appear to be greater from a study of state laboratory records than would be shown from a study of municipal laboratory records. It is impracticable for cultures to be sent in from rural patients as frequently as from city patients, and in addition two days, or a slightly longer period, is often consumed in the shipment of the specimen.

Five cases which have continued to harbor virulent diphtheria bacilli between 113 and 276 days have had tonsils and adenoids removed and have at once become freed of the infection.

DIPHTHERIA EPIDEMICS.

Some diphtheria epidemics have occurred but owing to the follow-up work and the cultural control of contacts, they have been checked before reaching any great size. Tables VI and VII give lists of the epidemics for 1914 and 1915, respectively, under the name of sanitary district, with the number of contacts examined, the total number of cultures taken from contacts, the number of positive cultures found in the taking of these cultures and the results obtained in checking further spread of the infection. Secondary cultures taken on the positive cases are not included in these tables.

CULTURES TAKEN AT THE UNIVERSITY HOSPITAL.

In January, 1914, the practice was commenced by the staff of the University Hospital of taking nose and throat cultures of all persons admitted to the Hospital. This procedure had been suggested in 1910 by Dr. F. F. Westbrook, then Dean of the Medical School and Director of the State Board of Health Laboratories, but owing to some expected difficulties in carrying out the details, it was not adopted until a number of small outbreaks occurred.

During the biennial period, 1914-1915, there were admitted to the hospital 3,583 persons. Of these, 71, or 1.98 per cent, showed the presence of organisms morphologically *B. diphtheriae*. In all cases showing positive cultures, isolation of the organism was attempted in order to make biological tests and to test the virulence. Of the 71, there were 10 in which isolation in pure culture was not accomplished; in two of these no later cultures were obtained; in 6, later cultures were negative, and in 2, 1 later culture was positive and the rest negative. Of the 61 in which a virulence test was made, 3 only showed the presence of a virulent organism. One of the three had mild pharyngeal symptoms, the other two, one of whom had been admitted to the hospital for tonsilectomy, had enlarged tonsils.

VIRULENCE TESTS.

Virulence tests are made as a matter of routine in cases showing *B. diphtheriae* in cultures and without clinical symptoms, and in all clinical cases continuing to have positive cultures an excessive time. In 1914 this period was set at 30 days, but owing to the fact that the large percentage

TABLE VI
CULTURAL CONTROL OF DIPHtheria EPIDEMICS IN 1914

County	Sanitary District	Date	Reason for Culture Taking	No. of Cultures Taken	No. of Persons Cultured	No. of Positive Cultures	Results
Anoka	Fridley	9-14	Clinical case on dairy farm	29	20	5	No further cases.
Beltrami	Alaska	10-6	4 clinical cases, 1 death	287	200	3	2 more cases, 12-4, 12-6.
Cass	Cass Lake	9-10	13 clinical cases	489	432	0	No further cases.
Clay	Glyndon	11-26	Fatal case	69	46	0	No further cases.
Freeborn	Albert Lea	11-16	Series of cases since Oct. '13. Many released without cultures	250	134	7	School nurse appointed Jan. 1915. Last case 2-26-15. Only 3 cases remainder of 1915.
Hennepin	Golden Valley	4-12	Clinical case on dairy farm	121	107	2	No further cases.
Itasca	Minneapolis (U. of M.)	3-12	Clinical case in fraternity house	39	39	0	No further cases.
Kanabec	Goodland	9-15	Clinical case in school	60	45	0	No further cases.
Kandiyohi	Comfort	3-14	Clinical case attended public supper	195	144	14	No further cases.
	Willmar	12-14	81 cases from Aug. '13-Dec. '14	385	295	5	2 later cases; 12-17, 12-20
Marshall	Wright township	9-22	Clinical cases released without cultures	173	156	15	Only 2 cases during 1915.
Meeker	Darwin	12-14	4 clinical cases in school	30	25	0	No further cases.
	Litchfield	3-25	7 clinical cases, 2 deaths	212	108	3	No further cases.
Pennington	Krakka	8-26	School exposure	60	41	1	No further cases.
Ramsey	Rose township	5-23	1 clinical fatal case in school	220	220	11	No further cases.
Redwood	Granite Rock	9-9	Clinical case in August. Cultures on opening of school	118	100	0	No further cases.
Rice	Dundas	5-23	Clinical case in school	123	98	5	No further cases.
	Faribault	5-2	School for Deaf, clinical cases 4-28	406	356	20	Last case 5-14.
	Faribault	10-10	School for feeble Minded, cases, 1 fatal, during typhoid epidemic	1,595	1,575	111	No further cases.
Stearns	St. Wendell township	2-24	Clinical case in school	133	97	5	No further cases.
Wright	French Lake	9-7	Clinical cases	94	53	1	No further cases.
Total				5,088	4,291	211	

*—2 released cases.

†—9 cases in 2 families.

TABLE VII
CULTURAL CONTROL OF DIPHTHERIA EPIDEMICS IN 1915

County	Sanitary District	Date	Reason for Culture Taking	No. of Cultures Taken	No. of Persons Cultured	No. of Positive Cultures	Results
Beltrami	Bemidji	11-30	Sore-throat case not quarantined; 6 clinical cases found.	374	296	11	No further cases.
Benton	Granite Lodge	10-14	Fatal case exposed family and school.	42	22	0	No further cases.
Chicago	Fish Lake	1-4	Case in Dec. Cultures on opening of school.	147	102	3	No further cases.
Clay	Georgetown	9-16	Unrecognized case exposed 3 schools.	58	47	1	No further cases.
	Spring Prairie	3-25	Cases in 2 families exposed 2 schools.	87	47	7	No further cases.
Hennepin	Plymouth	3-19	Public funeral of unrecognized case.	79	63	0	No further cases.
Isanti	Wyannette	3-10	Clinical cases in 4 families.	164	132	1	No further cases.
Lyon	Wyannette	8-25	Cultures on opening of school.	50	46	5	No further cases.
Meeker	Custer	1-20	4 clinical cases in school.	284	178	3	No further cases.
Mower	Dassel	10-28	8 clinical cases.	236	214	0	No further cases.
	Austin	9-17	Clinical cases; quarantine lax.	2,367	1,986	23	Cases ceased 10-25, 1 clinical case 11-18 in family of other cases; 2 cases in Dec., 1 of which was in family of other cases. No cases first half of 1916.
Norman	Gary	9-14	Cases in Aug. Cultures on opening of school.	103	101	5	No further cases.
Stearns	Lake George	10-14	Cases in several creameries, some not quarantined.	188	118	20	1 fatal case 11-15; 2 fatal cases in Dec.
	Spring Hill				334	31	case 10-26. No further cases
	Melrose	10-22		525	592	8	No further cases.
Swift	Paynesville	11-4	6 cases in school. 2 days with symptoms; infected outside city.	647	172	3	No further cases after second set of cultures.
	Benson	9-20	Teacher in school, 2 days with symptoms; infected outside city.	172	86		
	De Graff		Widespread exposure from 10 cases in 2 families; 3rd family infected (5 cases with 1 fatal case 10-17); 2nd set of cultures taken 10-20.	102	87	0	1 case infected in Minneapolis 2-19. No further cases.
Washington	Grant township	2-19	Case of sore throat; suspicious of diphtheria.	95	67	0	No further cases.
Wright	French Lake township	2-17	Clinical cases released without cultures.	5,720	4,518	93	
Total							

of such tests showed the organisms to be virulent, this period was changed in September, 1915, to 40 days.

Table VIII shows the results of these tests.

TABLE VIII
Classification of Virulence Tests During Biennial Period

	Positive		Negative		Total	
	1914	1915	1914	1915	1914	1915
Clinical cases	144	113	4	2	148	115
Non-Clinical cases	*3	12	69	65	72	77
Total	147	125	73	67	220	192

*—Two from the same person, 1 from eye and 1 from nose.

In the six clinical cases showing negative virulence tests, all had only mild symptoms of tonsilitis over a period of two days. Of the fourteen cases without symptoms showing virulence test positive, twelve were exposed intimately to clinical cases, and two were discovered in the routine taking of cultures on admittance to the University Hospital. Both had enlarged tonsils and one of them was in the hospital for tonsilectomy and are referred to under the previous heading.

TUBERCULOSIS.

During the biennial period, 3,739 examinations of sputum for tubercle bacilli have been made in the main laboratory, 2,004 in 1914 and 1,735 in 1915. The decrease in 1915 over 1914 is due to the closing of the laboratory for two and one-half months in 1915. The results of these examinations and the cases they represent, together with the number of counties and sanitary districts from which they came, are given in Tables IX and X.

TABLE IX
Results of Examinations of Sputum for Tubercle Bacilli

Year	Positive	Negative	Unsatisfactory	Total
1914	485	1,507	12	2,004
1915	513	1,216	6	1,735

TABLE X
Cases Examined and Counties and Sanitary Districts Represented

Year	Positive	Negative	Unsatisfactory	Total	Counties	Sanitary Districts
1914	406	1,409	11	1,826	80	619
1915	348	998	6	1,352	81	586

Animal Tests for Tuberculosis.

Animal tests for evidence of tuberculosis have been made in 45 cases; 19 of these tests were made in 1914 and 26 in 1915. A classification of these tests, with their results, is given in Table XI.

TABLE XI
Classification of Animal Tests for Tuberculosis for Biennial Period

	Sputum	Urine	Pleural Fluid	Spinal Fluid	Ascitic Fluid	Pus	Total
Positive.....	2	1	2	1	0	0	6
Negative.....	9	7	7	4	1	5	33
Unsatisfactory.....	2	1	1	0	0	2	6
Total.....	13	9	10	5	1	7	45

TYPHOID INFECTION.

The subject of typhoid infection has been a matter of special study during the biennial period. In addition to assisting physicians in the diagnosis of typhoid fever, much attention has been given to the search for typhoid carriers and to the value of the Widal test in diagnosis and in searching for carriers. A special study of the effect of typhoid vaccine upon the Widal reaction was made and also a study of the Widal reaction in tuberculous persons. Special examinations have been made, when possible, on any case developing typhoid fever after having been protected by typhoid vaccine.

During the biennial period, as an aid in diagnosis of typhoid infection, 4,469 Widal tests have been made in the Main Laboratory, 3,023 in 1914, and 1,446 in 1915. The results of these examinations are given in Table XII and the number of cases and sanitary districts represented by them are given in Table XIII.

TABLE XII
Classification of Widal Tests for Diagnosis of Typhoid Fever

Year	Positive	Negative	Atypical	Unsatisfactory	Total
1914.....	727	2,094	189	13	3,023
1915.....	337	1,040	58	11	1,446

TABLE XIII
Cases Examined and Counties and Sanitary Districts Represented

Year	Positive	Negative	Atypical	Unsatisfactory	Total	Counties	Sanitary Districts
1914.....	653	1,736	129	0	2,518	78	446
1915.....	298	912	32	9	1,251	78	369

In addition to these tests for diagnosis of typhoid infection, 8,759 Widal tests have been made on blood from persons receiving typhoid vaccine, and 612 from tuberculous persons.

TYPHOID VACCINE AND RESULTS OBTAINED FROM ITS USE.

The Board first authorized the free distribution of typhoid vaccine in January, 1913. During that year there was manufactured and distributed 15,940 c.c.; in 1914, 33,620 c.c., and in 1915, 18,160 c.c. Several state institutions have availed themselves of this opportunity of obtaining vaccine to immunize all inmates. The first institution to do so was the State Hospital at Fergus Falls, and so satisfactory have been the results that only one case of typhoid fever has occurred among the vaccinated. Three cases of paratyphoid fever occurred in 1913 among the vaccinated, and for this reason and owing to the recognized presence of paratyphoid

carriers in the institution, a mixed typhoid and paratyphoid vaccine has been used on patients admitted since April, 1914. No cases of paratyphoid fever have occurred in those vaccinated with the mixed vaccine.

In 1914, the State School for Feeble Minded at Faribault followed the example of the Fergus Falls institution and inoculated the inmates with typhoid vaccine. Unfortunately within one or two months following the completion of vaccination, the milk supply of the institution was heavily infected with typhoid bacilli and many cases of typhoid fever occurred. Undoubtedly but for the typhoid vaccine, a very much greater number of persons would have become sick. Having studied the Widal reaction in all inmates before and after injection of the vaccine, it was found on summarizing the 39 cases that occurred in the vaccinated that only one had shown the Widal reaction present after the three injections.

During 1915, in this same institution, 17 cases of typhoid fever with 7 deaths occurred among the vaccinated. Of these 17, only one showed the Widal reaction present on completion of vaccination. This case ran a usual course of typhoid fever and recovered. This seems of special interest in view of the fact that over 90 per cent of persons receiving three doses of typhoid vaccine show the reaction present according to the work of most workers on this subject and according to the results obtained in the Fergus Falls institution, where we found 92.8 per cent positive.

Outside of institutions, three, or possibly four, cases of typhoid fever have occurred in persons vaccinated with Minnesota State Board of Health vaccine. Enough vaccine has been distributed during the three years for about 27,000 persons.

The histories of the four cases are as follows:

1. W. G. (f) 14, vaccinated September, 1914; symptoms began December 26, 1914; very mild attack. No bacteriological examinations made. Widal reaction present January 2, 1915. No Widal test was made following the administration of the vaccine. Exposure was great as there were several other cases in the family preceding her symptoms.
2. O. O. (m) 49, vaccinated May, 1914; first symptoms September 24, 1915; Widal reaction absent October 1, 1915, and October 5, 1915, and present October 11, 1915. Case ran ordinary course. No Widal test after immunization.
3. H. C. F. (m) 47, vaccinated February, 1914. Widal reaction present at time of third inoculation. Symptoms December, 1915. *B. typhosus* isolated from feces December 16, 1915.
4. C. S. (f) 17, vaccinated August, 1914; first symptoms December 8, 1915; clinical diagnosis doubtful; probably very mild course of typhoid; urine examined bacteriologically January 19, 1916, but no typhoid bacilli were found.

It is to be regretted that the Widal test was not made in three of these cases following vaccination.

TYPHOID CARRIERS.

During the biennial period, 444 specimens of discharges have been examined to determine the presence of *B. typhosus* or *B. paratyphosus*. Of these, 293 were examined in 1914 and 151 in 1915.

The 293 specimens in 1914 were received from 98 persons, 9 being clinical cases and 89 suspected or possible carriers. Of the 9 clinical cases, 4 were found to harbor typhoid bacilli, and 5 paratyphoid bacilli. Of the 89 other cases, 29 were proven to be chronic carriers; 18 of *B. typhosus*, and 11 of *B. paratyphosus*. Many of these examinations were from persons in institutions where accurate history was unavailable and a concentrated effort was made to locate carriers. The 151 examinations in 1915 were made for 52 persons; 10 of whom were clinical cases and 42 suspected carriers. Of the 10 cases with suspicious symptoms, 5 were found to harbor typhoid bacilli, and in the remaining 5 no organisms of the typhoid group were found. Of the 42 suspected carriers, 8 were proven by isolation of *B. typhosus* and 5 by isolation of *B. paratyphosus* from the discharges to be carriers, and in 29 no typhoid bacilli were found. From one case both typhoid and paratyphoid bacilli were obtained. In many instances, specimens were collected from a group of persons by the field workers when only one was

really suspected from epidemiological data of being the carrier. This was done in order to obviate the necessity of a second trip.

Some interesting facts have presented themselves in these studies and the data collected on the carriers found outside of institutions is summarized below.

DETAILED STUDY OF TYPHOID CARRIERS DURING BIENNIAL PERIOD.

It has become the policy of the Division of Preventable Diseases of the Minnesota State Board of Health to determine if possible the source of infection of all sporadic cases of typhoid fever. During the past two years special attention has been paid to the search for carriers who may be the unrecognized causes of these cases, with the hope of instructing these persons in the necessary precautions to be taken to protect their relatives, friends and the public. In this way it is hoped to prevent large epidemics due to unrecognized carriers which have been all too common.

During the two years ending December 31, 1915, 41 carriers of *B. typhosus* or *B. paratyphosus* have been identified by the laboratory and it has seemed advisable to review a few of the interesting facts relating to these cases.

In the search for carriers the following routine method is pursued. When the epidemiological evidence points to an individual as a carrier or to a group of individuals as containing a carrier, blood specimens for the Widal test are collected from such an individual or group of individuals. Special attention is given to those persons who give a positive or possible history of typhoid fever. If in any of these suspects the Widal reaction is found to be present, specimens of the feces and urine are examined bacteriologically. Organisms isolated from the discharges are diagnosed *B. typhosus* or *B. paratyphosus* only after being found to conform to the recognized action of these organisms on the regularly used differential culture media and to be agglutinated by typhoid or paratyphoid serum. If the epidemiological information obtained points specifically to one or more individuals in whom the Widal reaction is absent, the discharges from such suspects are likewise examined. (See case No. 10 of this series.)

These 41 cases fall readily into two groups: Group I contains 21 persons, inmates of two state institutions, one for the insane and one for the feeble-minded, and 5 patients in tuberculosis sanatoria. Group II contains 15 persons found in the routine investigations to determine the sources of typhoid outbreaks.

Group I. The 21 persons in this group who were inmates of institutions were found to have the Widal reaction present in a study of the effects of typhoid vaccination in relation to the Widal reaction. All of these individuals had been residents of the institutions for a long time. Among these persons there was found to be a fairly large percentage of carriers of *B. paratyphosus*, 11 out of 21, besides one from whose discharges both *B. typhosus* and *B. paratyphosus* were isolated. Previous history of typhoid fever in these carriers could not be learned because of the mental condition of the individuals, all being either insane or feeble-minded. In these institutions typhoid had been endemic, but because of the nature of the patients and the community life, the exact number of cases traceable to each individual carrier could not be determined. The endemic typhoid was definitely proven epidemiologically to be of carrier origin.

The five remaining carriers in this group, who also had tuberculosis, were found in a study of the Widal reaction in the tuberculous. One showed the presence of *B. typhosus* in the feces and gave a history of typhoid fever 33 years previously. From the discharges of the other four, *B. paratyphosus* was isolated. One of these gave a doubtful history of typhoid fever, but the remaining three gave no typhoid history.

Group II consists of 15 carriers, 14 of *B. typhosus* and 1 of *B. paratyphosus*, found in the routine epidemiological investigations of sporadic cases during the two-year period.

1. Mrs. L. D. H., female, 40. In September, 1898, sixteen years previously, while a nurse, this woman had typhoid fever with a slow recovery followed by chronic appendicitis, rheumatism and "liver trouble." In 1909 her husband developed typhoid fever, although he gave a history of typhoid fever 45 years previously. In 1910, a nephew developed a fatal case of typhoid fever. In 1913, two farm hands had the disease.

2. Mrs. C. C. E., female, 68. History of typhoid fever in this case was in 1909, five years previously. The nurse in attendance developed typhoid fever and later in the same year two daughters and also a relative living nearby. In 1911 four cases occurred in the home of this relative, two belonging to the family, one an employe and one a boarder. In 1912, two cases, a neighbor and the granddaughter, developed typhoid fever directly traceable to Mrs. C. C. E. Two other cases in neighbors occurred the same year, both of whom denied direct association with this carrier but no other probable source of infection could be determined. In 1913 one case occurred in a neighbor who was a frequent visitor at this home and in 1914 a hired man at the C. C. E. home and a boy visitor developed typhoid fever.

3. Mrs. L. B., female, 68, had typhoid fever twenty-eight years previously, in 1886, as did also her husband. She and her husband have a small farm and keep two cows, selling the milk to neighbors. Many cases of typhoid fever occurred during the twenty-eight years among users of milk from this source, but information as to the entire number could not be obtained at the time of this investigation. One physician in the town recollected sixteen cases traceable to this source in the past seventeen years. In 1912, a sister developed typhoid fever after visiting on the farm and in 1913 two sisters-in-law and a brother-in-law. In 1914 a brother, the brother's wife and a neighbor developed typhoid fever.

4 and 5. W. W. S. and Mrs. W. W. S. The former, male, 83, developed typhoid in 1906 from contact with a clinical case infected while working with a threshing crew. In 1911, Mrs. W. W. S., age 79, and a daughter developed typhoid fever, both of which cases were undoubtedly due to W. W. S. Mrs. W. W. S. became a chronic carrier. In 1914, four cases developed on the farm, a son, a hired man, a maid, and the three-year-old daughter of an employe. Whether these four cases were due to W. W. S. or Mrs. W. W. S. cannot be determined.

6. M. J. R., male, 54, had typhoid fever in 1913, leaving him with a typhoid spine. He was responsible for six cases later in the same year in five relatives with whom he visited and one a fatal case in the hired man of these relatives. In 1914, four cases among relatives were traced to him. M. J. R. was incapacitated as a result of his typhoid infection and had no means of support. Because of this case the legislature was induced to appropriate \$500 a year for two years for the care of indigent typhoid carriers.

7. Mrs. K. K., female, 65, gave history of fever for seven weeks in 1894, no diagnosis being made. Mrs. K. K. and her husband had a small farm and kept seven cows, supplying milk, butter and cheese to neighbors. Three neighbors who boarded at the K. K. house developed typhoid, one in 1900, one in 1901 and one in 1902. In 1904, a woman from Norway visited the K. K. farm and developed the disease after three weeks' stay there and became a paratyphoid carrier, case No. 10 of this series. In 1908, an employe developed typhoid fever and died and in 1912 and 1913 two other employes got typhoid fever. In 1914, three persons in a neighbor's family who used milk from the K. K. farm and one visitor at the farm were infected. One of these became a chronic carrier, case No. 9. Four cases occurred the same year in a veterinarian's family supplied with cheese from this farm—the wife of the veterinarian died from complications. In 1915, after K. K. had been identified as a carrier and given instructions for proper care of her discharges she infected a boy who boarded there for a very short time.

8. Mrs. H. B., female, 65, had typhoid fever in 1908, being infected by her son, who was one of the many cases in a water-borne epidemic. Three relatives developed typhoid fever after visiting the H. B. home, one in 1910, one in 1912 and one in 1914.

9. Mrs. I. O., female, 54, developed typhoid fever in 1914 from carrier No. 7 of this series. So far no cases have been traced to this carrier and it is hoped that, having been identified as a carrier within a year after the disease, no later infections will occur.

10. Mrs. H. H., female, 44, developed typhoid fever in 1904 from contact with Mrs. K. K., carrier No. 7 of this series. Widal reaction with *B. typhosus* was absent at the time of the investigation but *B. paratyphosus* B. was isolated from the urine of this person. In 1914 a visitor at the home of Mrs. H. H. developed clinical typhoid fever and from her discharges *B. paratyphosus* was isolated. It is probable that if other examinations had been made in these cases typhoid bacilli might also have been found to be present.

11. Mrs. G. H. S., female, 37, had typhoid fever in 1906; was operated upon for gallstones four months later. In 1907, two sons developed typhoid fever from contact with her. In 1912, a farm hand and in 1914, a small daughter, both contracted typhoid fever.

12. Mrs. O. O., female, 34, gave history of typhoid fever in 1900. No cases could be definitely traced to this carrier until 1915, when her husband, a daughter and the domestic developed typhoid fever.

13. Mrs. E. B., female, 40, had typhoid fever in 1911. Later in the same year a son developed the disease and in 1912 three cases occurred, a son and two neighbors. In 1913, four cases appeared to be infected by this carrier, all of whom were neighbors more or less associated with Mrs. E. B. In 1914, the husband of Mrs. E. B. and a neighbor, and in 1915, another neighbor, contracted typhoid fever.

14. Mrs. M. K. A., female, 72, gave no definite history of typhoid fever but in 1875 she nursed her husband through a very severe attack of the disease. One can only speculate as to whether Mrs. M. K. A. was a carrier previous to 1875 and infected her husband or whether she became infected through nursing him. The husband died in 1892. As cases continued on the farm after his death it seems very probable that Mrs. M. K. A. has been the source of infection of all the cases—nineteen in all—occurring on the farm during the forty years since 1875. No cases occurred until 1882, when a grandson and a hired man contracted typhoid fever. In the following year, three daughters probably had typhoid fever, although in two of the cases no doctor was in attendance and the family called the disease "inflammation of the bowels." One of these two cases ended fatally. The next case occurred in 1892 when a son had a mild attack of typhoid fever. In 1902, a hired man, and in 1909, another son and a niece were victims. Following this three cases occurred in 1912 and one in 1913 in friends who visited the farm, and in 1914, four grandchildren and their mother had typhoid fever after some of the children had visited the grandmother. Two of these cases were undoubtedly secondary cases but were indirectly due to the grandmother. The last case occurred in a hired man in 1915. It was at the time of this case that the State Board of Health was asked by the attending physician to examine the well water as the family had decided to sell their 80-acre stock farm and get away from the typhoid infection. The epidemiologist advised that the sale be postponed until search be made for a carrier.

15. G. F., male, 55, had typhoid fever in 1901. This man, a minister, conducted a small parochial school. No cases were traced to this carrier until 1915, when a small boy who was a frequent visitor and carried milk to the G. F. home, developed typhoid fever.

TABLE XIV
HISTORY OF TYPHOID CARRIERS WITH CASES OF TYPHOID FEVER TRACED TO THEM

Case	Age at Time of Detection	Sex	Bacteriological Findings	Duration in Years Since Typhoid fever	Number Cases Infected	Deaths	Members of Family Infected	Employes or Boarders Infected	Relatives Outside Fam. Infected	Neighbors Infected
1.....	40	F	B. typhosus feces.....	16	4	1	1	2	†1	0
2.....	68	F	B. typhosus feces.....	5	15	0	2	4	6	3
3.....	68	F	B. typhosus feces.....	28	*23	0	0	0	6	17
4.....	83	M	B. typhosus feces.....	8	6	0	3	3	0	0
5.....	79	F	B. typhosus feces.....	3						
6.....	54	M	B. typhosus feces.....	1	10	1	0	†1	9	0
7.....	66	F	B. typhosus feces.....	20	*16	2	0	†9	0	†7
8.....	65	F	B. typhosus feces.....	6	3	0	0	0	3	0
9.....	54	F	B. typhosus feces.....	1	0	0	0	0	0	0
10.....	44	F	B. Paratyphosus urine.....	10	1	0	0	0	0	1
11.....	37	F	B. typhosus feces.....	9	4	0	3	1	0	0
12.....	34	F	B. typhosus feces urine.....	15	3	0	2	1	0	0
13.....	40	F	B. typhosus feces urine.....	4	11	0	3	0	0	8
14.....	72	F	B. typhosus feces.....	40	19	1	†6	3	6	4
15.....	55	M	B. typhosus feces.....	14	1	0	0	0	0	1
Total.....					116	5	20	24	31	41

*—Partially conveyed through milk, complete information unobtainable.

†—One fatal case.

The table shows that 116 cases, including 5 fatalities, have been traced to these 15 carriers, an average of 7.7 cases per carrier. Two of the 116 cases are known to have become chronic carriers. Twelve of the 15 carriers were females. Of the three male carriers in this group, only one is known to have infected a large number of persons, while of the 11 female carriers, from which it has been possible to trace secondary infections, an average of 9 cases has been traced to each. From the nature of their occupations, a larger proportion of female carriers would be likely to infect others, and hence one might expect to find more female carriers than male in routine investigations into the source of infection in sporadic or endemic typhoid. The writer has not summarized the reported carriers as to sex incidence, but it seems apparent that in the large number of carriers that have been detected in ordinary every-day life, females are considerably in excess of males. In our "routine" series, the proportion of females to males is 4 to 1.

In our institutional series the proportion of male carriers to female was as 1.4 to 1, the population consisting of 1.2 males to 1 female. In those persons merely suspected of being carriers, i.e., in whom the Widal test was positive but in whose discharges typhoid bacilli were not found in the few examinations made, the proportion of males to females was but slightly less than that of the proven carriers.

In our routine series the ages of the identified carriers varied from 34 to 83 years. All but two were 40 years or more of age, the average age being 57.3 years. The lapse of time between infection and identification of the carrier condition varied from 1 to 40 years, averaging 12 years, the average age at the time of infection being 45.3 years.

Long before the discovery of the typhoid bacillus, the relationship of typhoid fever to cholecystitis and cholelithiasis had been observed. In the later proof that typhoid bacilli are always present in the blood stream in typhoid fever, coupled with the early experimental production of infection of the gall-bladder in rabbits through injection of typhoid bacilli into the ear vein, we have the explanation of the gall-bladder type of typhoid carrier.

Certain factors which tend to stasis in the gall bladder are thought to have their influence upon the development of cholecystitis and cholelithiasis. These factors, many of which are present in those advanced in years, or in women, have again and again been enumerated in explanation of the fact that gall-bladder troubles are more prevalent after middle life than before, and in women than in men. If such explanation of the age and sex incidence of gall-bladder infections is correct, then we should expect to find a higher proportion of carriers in those who undergo a siege of typhoid fever late in life and in women rather than in the young and in men.

In our "routine" series the average age at time of infection, 45.3 years, appears strikingly suggestive when it is remembered that typhoid fever is most prevalent among the young. The proportion of females to males in this series, 4 to 1, appears to tally very closely with the sex incidence of cholecystitis and cholelithiasis in general.

It is regretted that a more complete study of the cases in the institutional series could not have been made. Possibly a knowledge of the age incidence of the infection of the identified carriers in this series would explain the lesser proportion of female to male carriers.

It is through the prevention of typhoid fever that we must hope for the prevention of typhoid carriers, for if typhoid fever is prevented, as by vaccination, even though typhoid organisms are taken into the digestive tract, no bacillaemia should occur and hence we should not expect the gall-bladder to become infected.

Should further study bear out the above suggestion as to the age and sex development of the carrier state, we should urge typhoid vaccina-

tion upon the middle-aged and those advanced in years and upon women, and not merely upon the young males together with a few males and females who are unusually exposed to typhoid infection, such as traveling men, crews of men, nurses and institutional employees.

CEREBRO-SPINAL MENINGITIS.

During the biennial period, 31 spinal fluids were received for examination for the presence of meningococci. Of these, 19 were examined in 1914, of which 4 showed the presence of meningococci; 10 were negative, 3 were contaminated, and 2 were lost through breakage of the container in transit. In 1915, 12 specimens were examined, 7 of which showed the presence of meningococci, 4 were sterile, and 1 contaminated. Of the 7 specimens showing meningococci, 3 were from one individual.

MISCELLANEOUS EXAMINATIONS.

The miscellaneous examinations have been steadily increasing. There were nearly twice as many made in 1915 as in 1914. In 1914, there were 30 such examinations, 7 of which gave positive findings and 23 negative, as follows:

- 14 blood cultures, 1 showed *B. typhosus* present; 13 negative.
- 3 cultures for identification of *B. typhosus*; 2 positive, 1 negative.
- 3 cultures for infecting organisms showed *staphylococcus pyogenes aureus*.
- 3 smears for tubercle bacilli—all negative.
- 1 piece of tissue for tubercle bacilli—negative.
- 1 blood smear for eosinophilia—negative.
- 1 swab suspected leprosy case—negative.
- 1 culture streptococci for virulence—negative.
- 2 smears for gonococci—negative.
- 1 spinal fluid for pneumococci—positive.

In 1915 there were 54 miscellaneous examinations, of which 24 yielded positive and 30 negative results, as follows:

- 3 blood cultures for *B. typhosus*—all negative.
- 6 specimens pus for infecting organisms—5 showed *staphylococcus pyogenes aureus* and one streptococcus.
- 9 cultures for influenza bacilli—all negative.
- 10 cultures for streptococci—all positive.
- 3 spinal fluids for streptococci—all negative.
- 1 pleural fluid for streptococci—negative.
- 3 stools for dysentery bacilli—1 positive, 2 negative.
- 2 smears for tubercle bacilli—both negative.
- 1 piece of tissue for tubercle bacilli—negative.
- 4 blood smears for eosinophilia—3 positive, 1 negative.
- 1 piece of ham for trichinae spiralis—negative.
- 3 sets of swabs from suspected leprosy cases—1 positive, 2 negative.
- 1 blood smear for malaria—negative.
- 4 stools for *entameba histolytica*—3 positive, 1 negative.
- 1 chicken head for fowl diphtheria—negative.
- 2 specimens, 1 urine and 1 sputum, for infecting organism, showed *staphylococci* and bacilli.

Animals Used.

In 1914 there were used in the Main Laboratory 550 guinea pigs and 3 rabbits, and in 1915, 488 guinea pigs.

DULUTH BRANCH LABORATORY.

The total bacteriological examinations made in the Duluth Branch Laboratory are given in Table I, which shows that 6,006 were made in 1914, and 5,032 in 1915. These examinations consist of cultures for diphtheria diagnosis, sputum for demonstration of tubercle bacilli and blood specimens for the Widal test.

DIPHTHERIA. . .

During the biennial period, 8,336 examinations were made for the presence of diphtheria bacilli. A classification of these examinations and the number of cases represented are given in Tables XV and XVI.

TABLE XV
Specimens Examined for Diphtheria Bacilli

	1914		1915		Total	
	Diagnosis	Release	Diagnosis	Release	1914	1915
For City of Duluth.....	2,304	1,625	1,824	1,020	3,929	2,844
Outside of Duluth.....	316	364	489	394	680	883
Total.....	2,630	1,989	2,313	1,414	4,609	3,727

TABLE XVI
Classification of Cases Examined in Duluth Branch

	1914			1915			Total	
	Positive	Negative	Reserved	Positive	Negative	Reserved	1914	1915
In City of Duluth..	109	1,232	11	65	935	17	1,352	1,017
Outside of Duluth..	34	115	9	27	380	27	158	434
Total.....	143	1,347	20	92	1,315	44	1,510	1,451

The cases examined in 1914 represent 33 sanitary districts in six counties, and in 1915, 22 sanitary districts in four counties.

TUBERCULOSIS.

Sputum examinations for the biennial period number 1,676, of which 830 were made in 1914 and 846 in 1915. Table XVII classifies these examinations and the cases they represent.

TABLE XVII
Classification of Specimens and Cases Examined for Tubercle Bacilli

	1914			1915			Total	
	Pos.	Neg.	Unsat.	Pos.	Neg.	Unsat.	1914	1915
Duluth Specimens.....	166	567	1	159	581	5	734	745
Duluth Cases.....	148	452	1	143	429	4	601	576
Outside Duluth Specimens.....	19	77	0	25	76	0	96	101
Outside Duluth Cases.....	18	71	0	24	72	0	89	96

These examinations represent 17 sanitary districts in six counties in 1914, and 28 sanitary districts in six counties in 1915.

TYPHOID FEVER.

Blood specimens for the Widal test number 951 for the biennial period, of which 540 were examined in 1914 in 27 sanitary districts in five counties, and 411 in 1915 in 32 sanitary districts in five counties. Table XVIII classifies these examinations and the cases represented by them.

TABLE XVIII
Classification of Specimens and Cases Examined for Typhoid Fever

	1914				1915				Total	
	Pos.	Neg.	Atyp.	Unsat.	Pos.	Neg.	Atyp.	Unsat.	1914	1915
Duluth Specimens.....	73	148	25	2	54	157	12	3	248	236
Duluth Cases.....	67	141	21	2	51	145	11	1	231	238
Outside Duluth Specimens.....	92	192	7	1	55	122	8	0	292	135
Outside Duluth Cases..	92	172	7	1	55	119	6	0	272	130

In addition to these tests for diagnosis of typhoid fever, 56 Widal tests were made from persons receiving typhoid vaccine.

WATER AND MILK EXAMINATIONS.

During the biennial period, 2,608 examinations were made for the Division of Sanitation. A classification of these is given in Table XIX.

TABLE XIX
Examinations Made for Division of Sanitation

Year	Water	Milk	Hypochlorite	Ice	Total
1914.....	558	535	22	0	1,115
1915.....	648	826	7	12	1,493
Total.....	1,206	1,361	29	12	2,608

MANKATO BRANCH LABORATORY.

The work in the Mankato Branch Laboratory consists of the same routine examinations as are made in the Duluth Branch Laboratory. The total examinations, as shown in Table I numbered 1,057 in 1914, and 1,105 in 1915.

DIPHTHERIA.

During the biennial period 1,401 diphtheria examinations were made, as shown in Table XX, and the cases for which these examinations were made are given in Table XXI.

TABLE XX
Diphtheria Examinations in Mankato Branch Laboratory

	1914		1915		Total	
	Diagnosis	Release	Diagnosis	Release	1914	1915
City of Mankato.....	53	6	50	46	59	96
Outside Mankato.....	269	329	321	327	598	648
Total.....	322	335	371	373	657	744

TABLE XXI
Classification of Cases Examined in Mankato Branch Laboratory

	1914			1915			Total	
	Positive	Negative	Reserved	Positive	Negative	Reserved	1914	1915
City of Mankato...	1	32	2	4	31	3	35	38
Outside Mankato...	43	132	39	33	169	29	214	231
Total.....	44	164	41	37	200	32	249	269

The cases examined in 1914 represent 71 sanitary districts in 18 counties, and in 1915, 61 sanitary districts in 19 counties.

TUBERCULOSIS.

There were made during the two years, 469 sputum examinations, 237 of which were made in 1914 and 232 in 1915. Table XXII classifies these examinations and the cases they represent.

TABLE XXII
Classification of Specimens and Cases Examined for Tubercle Bacilli

	1914			1915			Total	
	Pos.	Neg.	Unsat.	Pos.	Neg.	Unsat.	1914	1915
Mankato Specimens.....	16	53	0	14	61	0	69	75
Mankato Cases.....	13	40	0	11	48	0	53	59
Outside Mankato Specimens.....	39	129	0	40	117	0	168	157
Outside Mankato Cases.....	31	117	0	38	108	0	148	146

These examinations represent 71 sanitary districts in 17 counties in 1914, and 79 sanitary districts in 22 counties in 1915.

TYPHOID FEVER.

During the biennial period, 279 Widal tests were made, 160 in 1914, and 119 in 1915, as shown in Table XXIII. These were made for 62 sanitary districts in 17 counties in 1914, and 59 sanitary districts in 18 counties in 1915.

TABLE XXIII
Classification of Specimens and Cases Examined for Typhoid Fever

	1914				1915				Total	
	Pos.	Neg.	Atyp.	Unsat.	Pos.	Neg.	Atyp.	Unsat.	1914	1915
Mankato Specimens.....	9	26	0	0	2	7	1	0	35	10
Mankato Cases.....	8	19	0	0	2	7	1	0	27	10
Outside Mankato Specimens.....	37	85	3	0	19	89	1	0	125	109
Outside Mankato Cases.....	37	77	2	0	17	78	1	0	116	96

MISCELLANEOUS EXAMINATIONS.

1914.

- 2 blood smears for malaria—positive.
1 specimen for tetanus—positive.

1915.

- 3 specimens of city water for B. Coli.
3 spinal fluids for tubercle bacilli (micro. exam.)—negative.
1 spinal fluid for meningococci—positive.
1 smear for tubercle bacilli—negative.
1 urine for tubercle bacilli (micro. exam.)—negative.
1 spinal fluid for tubercle bacilli, animal test—negative.

SUMMARY.

The steady increase in the laboratory work can be seen from the following tables, XXIV, XXV and XXVI, which give the number of specimens examined during the last four years in each of the three laboratories.

This amount of work in the Main Laboratory has only been possible through the untiring efforts of Dr. McDaniel, who has willingly and unsparingly given much of her time to the work of the Main Laboratory. During only eight months of the two years did the laboratory have the services of an assistant bacteriologist. This means that the work has necessitated much overtime and night duty as well as constant daily attendance. Many of the specimens for the determination of typhoid carriers came in on night trains reaching Minneapolis between 5 p. m. and 12 p. m. and this necessitated the meeting of the train and the immediate attention to the specimens by the bacteriologist.

TABLE XXIV
Examinations Made in Main Laboratory for 4 Years

	1912	1913	1914	1915*
Diphtheria.....	13,255	16,171	23,761	19,378
Tuberculosis.....	1,323	1,515	2,004	1,735
Typhoid Fever.....	1,406	1,546	3,023	1,446
Virulence Tests—diphtheria.....	10	58	220	192
Animal tests—tuberculosis.....	8	18	19	26
B. typhosus isolations.....	0	10	293	151
Meningococci.....	4	12	19	12
Miscellaneous.....	0	2	30	54
Total.....	16,006	19,332	29,369	22,994
Average per day.....	43.7	52.9	80.5	80.1
Prophylactic Widal.....	0	5,224	8,329	430
Special Widal.....	114	134	91	521
Total.....	16,120	24,690	37,789	23,945
Average per day.....	44.0	67.6	103.5	83.4

*—Laboratory closed 78 days—lack of funds.

TABLE XXV
Examinations Made in Duluth Laboratory During 4 Years

	1912	1913	1914	1915
Diphtheria.....	2,162	7,567	4,609	3,727
Tuberculosis.....	624	714	830	846
Typhoid fever.....	335	664	540	411
Miscellaneous.....	0	0	0	1
Prophylactic Widal.....	0	0	27	29
Total.....	3,121	8,945	6,006	5,014
Average per day.....	8.5	24.5	16.4	13.7
Milk.....	304	497	535	826
Water.....	395	622	558	648
Hypochlorite.....	0	0	22	7
Ice.....	0	0	0	12
Total.....	699	1,119	1,115	1,493
Average per day.....	1.9	3.1	3.1	4.1
Total average per day.....	10.4	27.6	19.5	17.8

TABLE XXVI
Examinations Made in Mankato Laboratory During 4 Years

	1912*	1913	1914	1915
Diphtheria.....	328	1,215	657	744
Tuberculosis.....	139	207	237	232
Typhoid fever.....	69 ^o	127	160	119
Animal tests—tuberculosis.....	0	0	0	1
Miscellaneous.....	11	15	3	9
Total.....	547	1,564	1,057	1,105
Average per day.....	1.6	4.3	2.9	3.0

*—11 months.

EPIDEMIOLOGICAL WORK.

The complete records of all field investigations are on file in the office of the Division and a copy of the summary on each investigation has been sent to the executive officer of the State Board of Health and to the local health authorities and other persons who are officially or otherwise, entitled to a report. Here, lack of space forbids special mention of many investigations which might interest both lay and professional readers.

The character of the field work, the counties and sanitary districts concerned are shown in the lists and maps which follow. However, brief accounts of two county tuberculosis surveys and of the epidemic spread of poliomyelitis are included in the report of this Division. The two county tuberculosis surveys were made for the purpose of obtaining data of interest to the voters of Blue Earth and Le Sueur counties when the tuberculosis sanatorium question was about to be decided at an election. The epidemiological study of poliomyelitis published in a previous report of the Division of Epidemiology has been continued by Dr. W. P. Greene. A special report is made on certain interesting features observed in the investigation of the poliomyelitis epidemic in the autumn of 1915, in the vicinity of St. Cloud.

Special reports elsewhere in this volume cover Dr. H. A. Burns' work in the Benson typhoid fever epidemic, and Dr. W. P. Greene's work in the New Ulm typhoid fever epidemic, and Dr. H. G. Lampson's social and economic study of the tuberculosis in two county institutions. The reports on the typhoid epidemics show the co-operative work between the Division of Sanitation and this Division.

These reports are of importance since the public water supplies now are rarely concerned in the spread of typhoid infection in Minnesota. Barring accident and criminal neglect, the chance of large public water supplies becoming polluted is now very small. Either the supply is obtained under conditions that exclude pollution, or it is subjected to some form of purification. The Division of Sanitation periodically checks up public water supplies and sees that faulty conditions are remedied, but other routes of infection such as milk, fingered food, flies and contact act in the spread of infection from typhoid cases and chronic carriers.

Every typhoid convalescent should be kept under supervision by the local health officer and Widal tests and examinations of discharges should be made at intervals in order to determine whether the typhoid convalescent becomes a chronic carrier of typhoid germs.

The danger from chronic carriers has been under-estimated. Epidemiological clues indicating spread of infection from carriers usually have been proved to be correct through isolation of typhoid bacilli from the suspected carrier's discharges. The detection of typhoid carriers by laboratory tests and supervision of carriers by local and state agencies, together with increasing efforts to popularize the use of the State Board of Health free typhoid prophylactic vaccine will do much to eliminate typhoid fever from Minnesota.

TUBERCULOSIS SURVEYS.

(1.) BLUE EARTH COUNTY.

Dr. H. A. Burns of the Division of Preventable Diseases, State Board of Health, with Dr. C. C. Pratt, Health Officer of Mankato, working in co-operation with local physicians, recently investigated the tuberculosis problem in Blue Earth County. Owing to bad roads the investigation in rural districts was not completed, but in Mankato the situation was well covered. The problem concerns the county as a unit, for no locality is free from danger, as will be shown in detail when the rural work is finished.

The investigators had a list of families in which deaths or existing cases of tuberculosis had been reported by local physicians. These families were investigated and the symptoms and case histories of the affected persons in the families were noted and carefully studied. In addition information given by the families with regard to other persons who were known to have been exposed to the disease in the families was followed up.

Seventy families were included in the first list. Twenty-one of these families could not be located, having moved away or died out. Forty-nine families were found. In twenty-two of these families no cases were discovered. In seven of the twenty-two families mentioned the fatal cases were due to meningeal or peritoneal tuberculosis. These types of tuberculosis are not dangerous when compared with pulmonary tuberculosis, because the germs are not thrown out by coughing and spitting. In the remaining fifteen of the twenty-two families, it is probable that incipient cases exist, for our methods, which were necessarily limited in such a rapid investigation, are not calculated to discover such cases.

In the other twenty-seven families there are ninety-six persons, fifty-four of whom show symptoms of active or incipient tuberculosis. In these families there have occurred to date twenty-six deaths from tuberculosis, five during the last four years. Of the fifty-four infected persons, thirty-three are advanced cases, fourteen are moderately advanced, and seven are incipient cases of tuberculosis.

There is every reason to believe that (1) the thirty-three advanced cases will terminate fatally within a comparative short time and that they may infect other persons before death, (2) that in the fourteen moderately advanced cases the disease will not be arrested under the present conditions, but they will develop into "open" cases and may infect others before death, and (3) that the seven incipient cases may not recover unless a different treatment than that now possible is given.

In following up the information given by these families, **twenty-seven unreported cases of tuberculosis were found.** Seventeen of these are "open" cases. Upon investigation it was found that only two of the seventeen dangerous cases are taking adequate precautions to protect other members of their families. Many of the families are **unable financially to provide either adequate care for the treatment of curable cases or suitable protection for cases.** This shows the great need for a county sanatorium.

Aside from sickness and death losses, the commercial interests of the community may suffer, since among the "open" cases in Mankato were found persons working as housemaids, seamstresses, clerks in candy stores, etc., and in one public school five children were found who had tuberculosis. When the public understands the danger from such persons it is likely that fear of the disease will arise out of proportion to the actual danger and business will suffer accordingly.

In the rural districts tuberculosis exists on many farms where butter is made or from which milk is sold. So far as the limited investigation has proceeded, in no case was it found that adequate precautions were being taken to safeguard the public either from association with affected persons or against the infection of food or milk by infected persons. In fact, such action is out of the question unless a sanatorium is provided near the homes of these people, where they will willingly go and where they may be treated with the best results at the minimum expenditure.

The death rate from tuberculosis in Blue Earth County is not declining. In 1912 there was the same number of deaths (33) as in 1903.

Deaths from Tuberculosis in Blue Earth County

1903.....	33	1907.....	32	1910.....	29
1904.....	31	1908.....	36	1911.....	41
1905.....	31	1909.....	27	1912.....	33
1906.....	31				

Deaths from Tuberculosis in Mankato City

1903.....	16	1907.....	22	1910.....	18
1904.....	18	1908.....	18	1911.....	12
1905.....	15	1909.....	13	1912.....	21
1906.....	22				

The number of deaths per year has varied somewhat, but the death rate per 10,000 of population is very high, as is shown by the following tables for Blue Earth County and for Mankato city, 1903 to 1912, inclusive.

Year	Blue Earth County	Mankato City	Year	Blue Earth County	Mankato City
1903.....	10.5	15.2	1908.....	12.0	17.3
1904.....	11.3	17.1	1909.....	9.0	12.5
1905.....	10.1	14.3	1910.....	9.9	17.4
1906.....	10.2	21.1	1911.....	17.4	11.6
1907.....	10.6	21.1	1912.....	11.3	20.2

The death rate from tuberculosis per 10,000 population throughout Minnesota as a whole between 1891 and 1900 was 10.7. It was the same in 1912.

Probably this report does not show more than one-half of the total number of persons now suffering from tuberculosis in Blue Earth County. This statement is based upon a comparison of the death rate and population in that part of the county included in this investigation with the remainder of the county.

During 1913 there were twenty-one deaths, but only six cases of tuberculosis reported. In 1914, first quarter, there were twelve deaths and only eight cases reported.

As a basis for this work, families having had deaths from tuberculosis since 1910, together with those in which it was reported that cases existed, were investigated.

Cases were classified (on account of necessarily rapid work) as follows:

1. Active Cases:

Cases diagnosed and reported by family physicians.
Cases with tubercle bacilli found in sputum.
Cases with unmistakable symptoms and history of intimate exposure.

2. Infected Cases:

Persons intimately exposed, for long time; never given physical or sputum examinations but with definite history of the usual symptoms in incipient cases.

3. Suspected Cases:

Exposed persons, without positive symptoms but with suspicious histories.

Undoubtedly many infected cases but showing no obvious signs of tuberculosis are not included.

Results

Families Seen	Children	Adults	*A	*B	Active	Infected	Suspected
(1) 27.....	42	54	71	25	33	14	7
(2) 37.....	84	79	131	32	*1	3	5
(3) 6.....	1	6	4	3	.....	.....	.....
(4) 70.....	127	139	206	60	34	17	12

- (1) Families with active and "open" cases; (26 deaths).
 (2) Families with total of 40 deaths; no cases found.
 (3) Families with ten deaths; no information obtained.
 (4) Totals: (Note: 69 deaths were pulmonary and 7 non-pulmonary cases).

*—Case not seen; lives in Ohio.

**—Exposure: A equals six months or more. B equals less than six months.

Ten families who have or have had until recently open cases of tuberculosis, were examined for evidence of tuberculosis, and von Pirquet tests were made as follows:

Family	Adult	Children	Physical Signs				Von Pirquet Test				Previous Deaths
			Children		Adult		Children		Adult		
			+	-	+	-	+	-	+	-	
O. L.....	3	1	1	.....	1	2	1	.....	1	2	1
A. M.....	2	1	.....	1	.....	2	1	.....	2	2	2
F. A.....	2	1	.....	1	.....	1	1	.....	1	1	.....
M. A.....	2	.....	.....	1	.....	1	1	.....	.....	2	.....
G. L.....	5	1	.....	1	.....	5	1	.....	.....	5	2
F. M.....	6	2	.....	2	.....	5	1	1	.....	2	4
F. R.....	1	1	.....	1	.....	1	1	.....	1	1	1
F. M.....	2	5	1	4	1	1	.....	5	1	1	.....
H. V. E.....	4	4	1	3	1	3	.....	2	2	2	.....
F. W.....	4	1	.....	1	.....	1	3	.....	1	3	1
10	31	17	3	14	7	24	8	9	9	22	9

Dr. Pratt visited families where deaths from tuberculosis had occurred and families who now have open and non-open cases, and all families with suspected cases.

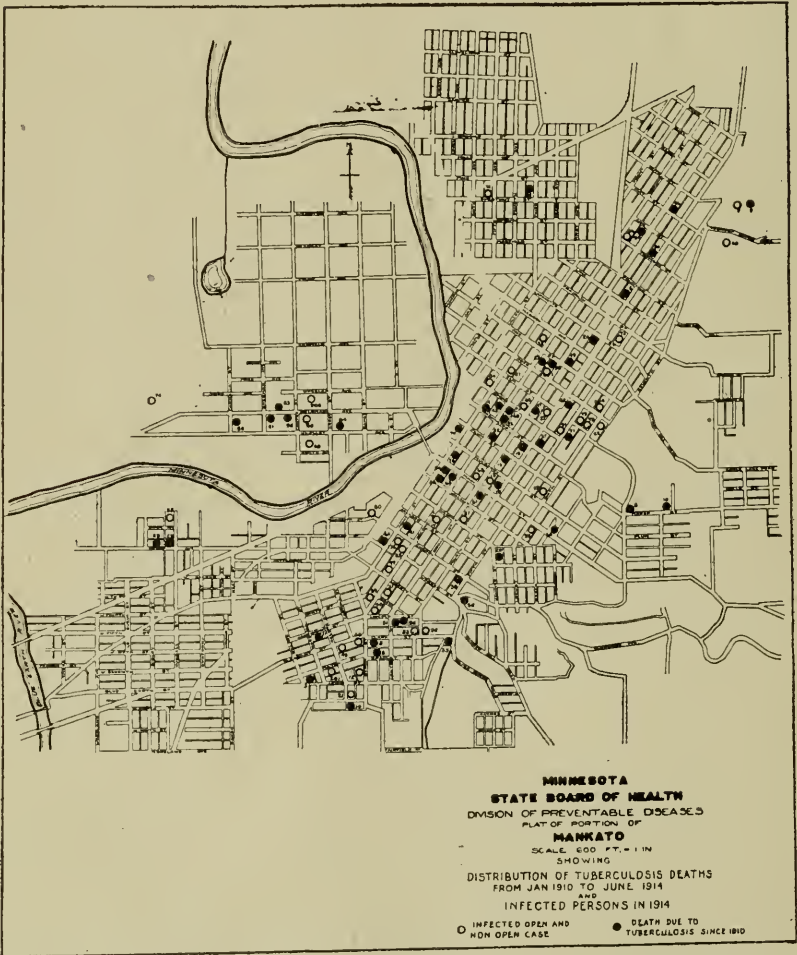
The result is shown below:

Sanitary Districts	Existing Cases		Deaths Jan. 1910 to June 1914
	Not open	Open	
Butternut Valley Township.....	2		4
Cambria Township.....	1		1
Cambria Village.....		3	
Ceresco Township.....		1	
Danville Township.....			2
Decoria Township.....		1	3
Garden City Township.....		1	10
Lake Crystal Village.....		6	
Judson Township.....		1	3
Jamestown Township.....		2	5
Madison Lake Village.....	1	1	
Le Roy Township.....	1	1	4
Lincoln Township.....			2
Lime Township.....		1	4
Lyra Township.....		1	2
McPherson Township.....			2
St. Clair Village.....		3	
Medo Township.....		1	2
Mapleton Township.....		3	8
Mankato Township.....	1	2	6
Mankato City.....	8	34	56
Shelby Township.....			2
Pleasant Mound Township.....		1	2
South Bend Township.....			1
Rapidan Township.....	1	2	6
Vernon Center Township.....			1
Sterling Township.....	1	1	3
Total.....	16	66	129

TUBERCULOSIS SURVEY INCOMPLETE, BLUE EARTH COUNTY

Showing DEATHS in Mankato Between January, 1910, and June, 1914, and
 RECOGNIZED EXISTING CASES

To Supplement Summaries 112, XIV-192, XIV-204, XIV-213, XIV-214, XIV-217,
 XIV-218, XIV.

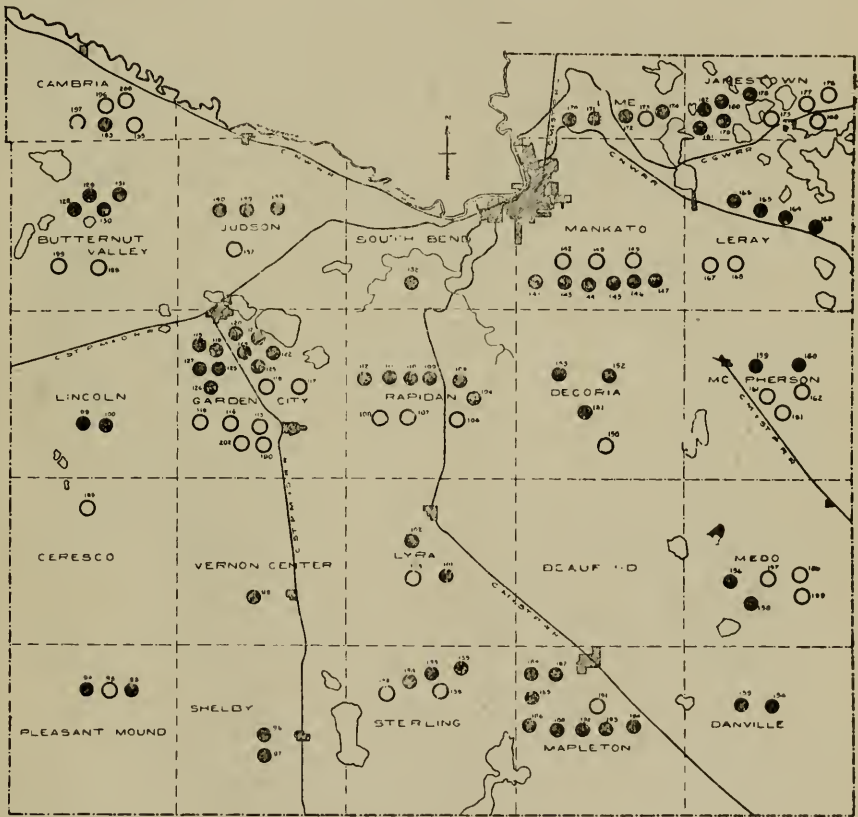


TUBERCULOSIS SURVEY INCOMPLETE, BLUE EARTH COUNTY.

Showing DEATHS in Certain Rural Districts, Between January, 1910, and June, 1914, and RECOGNIZED EXISTING CASES.

An Incomplete Survey.

To Supplement Summaries 112, XIV-192, XIV-204, XIV-213, XIV-214, XIV-217, XIV-218, XIV.



MINNESOTA STATE BOARD OF HEALTH
DIVISION OF PREVENTABLE DISEASES

MAP OF
BLUE EARTH COUNTY
SHOWING
DISTRIBUTION OF TUBERCULOSIS DEATHS
FROM JAN 1910 TO JUNE 1914
AND
INFECTED PERSONS IN 1914

○ INFECTED OPEN AND NON OPEN CASE ● DEATH DUE TO TUBERCULOSIS SINCE 1910

(2.) LE SUEUR COUNTY.

This work was hurriedly and incompletely done on account of lack of time. It was done for the purpose of obtaining data for the voters of Le Sueur County, that they might vote more intelligently on the question as to whether or not they would join a group of southern counties in the erection of a sanatorium under the State Aid Law.

Dr. H. G. Lampson began this survey February 9, 1915, which occupied twenty-one days between that date and March 5. On account of the almost impassable condition of the country roads at that season, the work had to be confined chiefly to the cities and villages along the railroads. Many townships were not reached at all and none was thoroughly worked. No educational work was undertaken until the last week, when a series of meetings were arranged in six cities and villages at which the executive officer made addresses. The townships of Cordova, Kasota, Sharon, Tyrone and Elysian were fairly well covered, but Cleveland, Derrynane, Elysian, Kilkenny, Lanesburgh, Lexington, Montgomery, Ottawa, Washington and Waterville townships were practically not surveyed except as to the cities and villages lying within their borders.

The result of the election was unfavorable to the sanatorium proposition, but was encouraging in that votes in cities and villages where the meetings were held and where data were obtained were favorable, while those in the unsurveyed territory were almost solidly against it.

Most of the work done was in Cordova and Tyrone townships and the cities and villages of Kasota, Le Sueur, Le Sueur Center and New Prague. The townships of Kasota and Sharon were partly covered and the cities of Montgomery and Waterville, but of the 51 cases of tuberculosis discovered, 41 were in the first-mentioned group.

In Tyrone township, 3 "open," 2 incipient and 2 suspected cases were found. The "open" cases were all living without any adequate precautions and each exposing a group of people, 14 in all.

Derrynane and Lanesburgh townships were not surveyed.

In Sharon township, one advanced "open" case was found where no adequate precautions were being taken to protect 4 exposed persons.

Lexington, Montgomery and Ottawa townships were not surveyed.

In Kasota township, 1 case was seen, which was undoubtedly an "open" case intermittently, and was fully exposing a group of 5 people.

Cleveland village and township were not surveyed.

In Cordova township, 1 "open" case and 3 suspects were found, living without precautions and exposing at least 4 people.

Elysian, Kilkenny, Washington and Waterville townships were not surveyed.

In Le Sueur city, 5 "open" cases, 1 suspect and 2 arrested cases were visited. The "open" cases were all inadequately guarded and were exposing 12 people.

In New Prague village, 3 "open" cases and 4 incipients were found. The "open" cases were living with no precautions whatever and were constantly exposing 16 people.

In Montgomery city, 1 "open" case, 1 incipient and 1 suspect were found in a very superficial survey. The "open" case was exposing 3 people.

In Waterville city, 1 "open" case and 2 suspects were found. The "open" case was fully exposing 1 other person and partly exposing a family group, the size of which was not ascertained.

In Elysian village, 1 suspect was found.

In Kasota village, 2 incipients, 2 suspects and 1 arrested case were found. The incipients, one of whom may have been an "open" case, were living in family groups. One suspect was exposing a group of 7 persons.

In Le Sueur Center city, 2 "open" cases, 1 incipient, 5 suspects and 2 arrested cases, were found. The "open" cases were exposing, without precautions, at least 8 people.

Eighteen "open" cases were fully exposing, practically without precautions, 84 people, some of whom are already incipients and suspects. The exposed people considered are those in the family circle only.

The accompanying table shows the classification and distribution of cases in five townships and seven cities and villages. Nine townships were not entered at all and only two of the five surveyed were done thoroughly. Of the seven cities and villages surveyed, only two were done thoroughly.

Sanitary Districts	"Open"	Incipient	Suspects	Arrested	Total
Townships:					
Cleveland.....					0
Cordova.....	1		4		5
Derrynane.....			1		1
Elysian.....					0
Kasota.....	1				1
Kilkenny.....					0
Lanesburgh.....					0
Lexington.....					0
Montgomery.....					0
Ottawa.....					0
Sharon.....	1				1
Tyrone.....	3	2	2		7
Washington.....					0
Waterville.....					0
Cities and Villages:					
Elysian.....			1		1
Le Sueur.....	5		2	2	9
Le Sueur Center.....	2	1	6	2	11
Kasota.....		2	3	1	6
Montgomery.....	1	1	1		3
New Prague.....	3	4			7
Waterville.....	1		2		3
Total.....	18	10	22	5	55

The population of the county is 18,600. The population of the whole area visited is about 10,000. As much of this area was gone over superficially, it is safe to say that not over half, and probably one-fourth, of the cases in the county were found.

In the rural districts, the cases found were in the proportion of 1 to 267 of population, and in the cities and villages, 1 to 182, or a combined proportion of 1 to 225. Taking only the districts most thoroughly surveyed, the proportions are 1:160 in cities; 1:160 in townships.

AN EPIDEMIOLOGICAL STUDY OF POLIOMYELITIS.

It has been our practice to investigate every available case of poliomyelitis or cerebro-spinal meningitis and to tabulate the data of the poliomyelitis cases as outlined in the original study by Dr. H. W. Hill. Dr. W. P. Greene has been assigned to this work, whenever possible, in order that one man might see a large number of cases, collect the epidemiological data and draw his conclusions therefrom.

In the following tabulations no cases are included of the abortive or non-paralyzed type. In the brief account of the epidemic centering about St. Cloud in the autumn of 1915, the non-paralyzed cases associated with paralyzed cases are considered, but in these tabulations only the paralyzed cases of the "St. Cloud" epidemic are included.

This study covers seven cases occurring in 1913, but not reported in full in time for inclusion in the last biennial report, and ten 1914 cases and twelve 1915 cases not related to the sixty-four cases of the "St. Cloud" epidemic, making a total of ninety-three paralyzed cases.

Comparing the results of tabulations of these ninety-three paralyzed cases with those of previous studies, no differences worth commenting upon are to be observed (see Division of Epidemiology report included in Fifth Biennial Report of the State Board of Health, and "Epidemiologic Study of Anterior Poliomyelitis in Minnesota," by Dr. H. W. Hill, in 1910, Transactions of Section on Preventive Medicine and Public Health, of the American Medical Association).

POLIOMYELITIS IN MINNESOTA

Year	Jan.		Feb.		Mar.		April		May		June		July		Aug.		Sept.		Oct.		Nov.		Dec.		Total	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
1910.....	23	6	8	11	9	9	5	4	8	3	19	8	45	15	140	49	117	47	85	29	17	13	5	5	481	201
1911.....	4	3	6	4	6	5	5	4	9	2	14	6	31	11	18	4	9	7	7	6	4	4	2	2	115	58
1912.....	2	3	2	2	5	4	3	1	1	1	0	0	4	4	4	0	3	2	4	3	5	2	2	1	35	23
1913.....	4	5	2	1	2	1	4	5	0	0	4	3	13	2	39	5	10	5	4	0	2	2	1	1	85	30
1914.....	6	3	1	1	1	0	3	2	1	1	1	0	2	1	1	0	1	0	3	1	2	0	0	0	22	8
1915.....	3	4	1	1	2	2	1	1	0	0	2	2	1	1	28	2	38	6	27	5	17	2	3	3	123	26
1916.....	2	4	3	2	1	0	0	0	9	3	16	0	224	9	343	40	197	27	95	14	17	5	5	912	105	

TABLE 1—Basic Data Required (Cases of Poliomyelitis With Paralysis Alone Considered)

Ages in Years	Total Well Males	Total Well Females	Total Sick Males	Total Sick Females	Total Deaths Males	Total Deaths Females	Total Secondary Males	Total Secondary Females
Not given.....	34	16	0	0	.....	.....	.....	.....
Under one.....	7	8	5	0	1	.....	.....	.....
	41	24	5	0	1	.....	.....	.....
One.....	6	3	8	5	1	2	.....	.....
Two.....	9	8	8	6	.....	.....	2	1
Three.....	6	6	5	6	.....	.....	.....	2
Four.....	11	2	6	4	.....	.....	.....	.....
Five.....	10	3	0	3	1	.....	.....	1
One to Five.....	42	22	27	24	2	2	2	4
Six.....	6	10	2	3	1	1	.....	1
Seven.....	9	5	1	2	.....	.....	1	.....
Eight.....	10	3	3	1	1	.....	1	.....
Nine.....	9	4	1	2	.....	1	.....	.....
Ten.....	3	7	0	2	.....	.....	.....	1
Six to Ten.....	37	29	7	10	2	2	2	2
Eleven.....	6	7	1	0	.....	.....	.....	.....
Twelve.....	3	4	2	0	.....	.....	.....	.....
Thirteen.....	3	2	0	0	.....	.....	.....	.....
Fourteen.....	3	4	1	1	2	.....	.....	1
Fifteen.....	1	3	4	0	1	.....	.....	.....
Eleven to Fifteen...	16	20	8	1	3	0	0	1
Sixteen.....	1	3	0	0	.....	.....	.....	.....
Seventeen.....	0	1	1	0	.....	.....	.....	.....
Eighteen.....	2	2	0	0	.....	.....	.....	.....
Nineteen.....	1	3	0	0	.....	.....	.....	.....
Twenty.....	1	0	0	1	.....	1	.....	1
Sixteen to Twenty..	5	9	1	1	0	1	0	1
Adults.....	116	104	9	0	1	0	0	0
Total.....	257	208	57	36	9	5	4	8
Total.....	465		93		14		12	

This Table Includes:

- 7 histories—1913
- 10 histories—1914
- 12 histories—1915
- 64 histories—1915 (St. Cloud epidemic).

93

TABLE 2—Family Distribution of Cases

Families With	Number of Families	Initial Cases	Subsequent Cases	Total Cases
One case.....	86	86	0	86
Two cases.....	2	2	2	4
Three cases.....	1	1	2	3
Total.....	89	89	*4	93

*—8 assumed secondaries in different families.

TABLE 3—Time Distribution of 93 Cases (Chiefly Rural) in Minnesota

Year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1913.....								1	1	3	2		7
1914.....	1	1	1	1	1		2	1	2				10
1915.....	1		1					2	3	2	1	2	12
St. Cloud Epi- demic.....								19	27	13	5		64

TABLE 4—Poliomyelitis Cases per Unit of Population in Minnesota

St. Paul.....	2 - .008 per 1,000
Minneapolis.....	3 - .009 per 1,000
St. Cloud.....	18 - .16 per 1,000
State in general (rough estimate).....	70 - .035 per 1,000

Note: In the St. Cloud epidemic 35 cases were in cities and villages and 29 were country cases.

TABLE 5—Crude Attack Rates (Cases of Poliomyelitis with Paralysis Alone Considered)

Ages in Years	Total Persons Not Sick in Affected Families			Total Sick Persons in Affected Families			Crude Attack Rate		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Not given.....	34	16	50	0	0	0			
Under 1.....	7	8	15	5	0	5	42	0	25
1 to 5.....	42	22	64	27	24	51	29	52	44
6 to 10.....	37	29	66	7	10	17	16	26	20
11 to 15.....	16	20	36	8	1	9	33	5	20
16 to 20.....	5	9	14	1	1	2	17	10	13
Adults.....	116	104	220	9	0	9	7	0	4
Total.....	257	208	465	57	36	93	18	15	17

TABLE 6—Primary and Secondary Rates with Ratios—Poliomyelitis, Diphtheria and Scarlet Fever

Ages in Years	Poliomyelitis				Diphtheria				Scarlet Fever			
	Primary Rates		Secondary Rates		Primary Rates		Secondary Rates		Primary Rates		Secondary Rates	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Under 1.....	41.6	0	0	0	8	8.4	8.2	7.1	11	43	4.9	5.2
1 to 5.....	36.2	43.3	4.8	18.2	36	33	27	30	41	39	30	27
6 to 10.....	11.3	20.5	5.4	6.9	33	37	18	22	40	44	24	27
11 to 15.....	33.3	0	0	5.0	17	22	10	14	22	30	9	17
16 to 20.....	16.6	0	0	11.1	13	14	6	9	10	12	4	6
Adults.....	4.0	0	0	0	3.6	5.8	1.8	4.9	3	3	7	1.7

TABLE 6—Continued

Ages in Years	Poliomyelitis		Diphtheria		Scarlet Fever	
	Ratio Primary to Secondary		Ratio Primary to Secondary		Ratio Primary to Secondary	
	Male	Female	Male	Female	Male	Female
Under 1.....	0	0	102	84	44	121
1 to 5.....	13	42	75	91	73	70
6 to 10.....	44	31	54	59	60	61
11 to 15.....	0	0	60	64	41	56
16 to 20.....	0	0	46	64	40	50
Adults.....	0	0	50	84	23	56

TABLE 7—Relative Number of Secondary Cases to Primary Cases in Poliomyelitis, Diphtheria, Scarlet Fever

Ages in Years	Poliomyelitis		Diphtheria		Scarlet Fever	
	Male	Female	Male	Female	Male	Female
Under 1 to 10.....	11	21	44	48	45	38
11 to 20.....	0	0	48	52	33	40
Adults.....	0	0	48	88	23	54
Total percentage for each sex.....	7.5	29	45	54	41	39
Total percentage for each disease.....	15		50		40	

TABLE 8—Distribution of Deaths by Families for 93 Cases (Cases of Poliomyelitis with Paralysis Alone Considered)

Families with	Total Families	*Families	*Cases	Deaths
1 case.....	86	{ 74 12	{ 74 12	12
2 cases.....	2	{ 1 1	{ 3 1	
3 cases.....	1	{ 1	{ 2 1	
Total.....	89	89	93	14

*Recovered cases separated from fatal cases by family groups.

TABLE 9—Fatality Rate for 93 Paralyzed Cases of Poliomyelitis Compared with Chapin's Rates for Diphtheria and Scarlet Fever

Ages in Years	Cases			Deaths			Fatality			Fatality	
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Diphtheria	Scarlet Fever
Under 1.....	5	0	5	1	0	1	20	0	20	38	18
1 to 5.....	27	24	51	2	2	4	7.4	8.3	5.8	29	14
6 to 10.....	7	10	17	2	2	4	28	20	23	12	5.7
11 to 15.....	8	1	9	3	0	3	37	0	33	5.1	3.5
16 to 20.....	1	1	2	0	1	1	0	100	50	4.8	4.2
Adults.....	9	0	9	1	0	1	11	0	11	2.8	6
Total.....	57	36	93	9	5	14	15.7	13.8	15	15.5	8.3

TABLE 10—Intervals Between Initial and Subsequent Cases in Families Having More Than One Case

Intervals—Days	Apparent Secondaries Showing These Intervals		Total
	Males	Females	
4.....	0	3	3
8.....	1	0	1
10.....	1	0	1
11.....	0	1	1
12.....	0	1	1
14.....	1	2	3
15.....	1	0	1
42.....	0	1	1
Total.....	4	8	12

TABLE 11—The Day of the Disease on Which Paralysis Occurred (93 Cases)

Day	Number of Cases	Per Cent.
1st, i. e., day* of onset.....	9	10
2nd, i. e., day of onset.....	11	12
3rd, i. e., day of onset.....	23	24
4th, i. e., day of onset.....	15	16
5th, i. e., day of onset.....	14	15
6th, i. e., day of onset.....	8	9
7th, i. e., day of onset.....	3	3.2
8th, i. e., day of onset.....	3	3.2
10th, i. e., day of onset.....	1	1.0
12th, i. e., day of onset.....	1	1.0
15th, i. e., day of onset.....	1	1.0
Date of onset of paralysis not given.....	4	4.4
Total.....	93	100.0

TABLE 12—Outcome of 93 Cases

Partial recovery.....	58%
Complete recovery.....	19%
Survival but no improvement.....	11%
Death.....	12%

TABLE 13—Quantitative Clinical Characteristics

Fever was reported in.....	.95%	of 93 cases
Headache and pain in.....	.94%	of 93 cases
Tenderness in.....	.63%	of 93 cases
Constipation in.....	.65%	of 93 cases
Vomiting in.....	.46%	of 93 cases
Retraction of head in.....	.37%	of 93 cases
Sore throat in.....	.18%	of 93 cases

TABLE 14—Relation of Constipation to Sore Throat in 93 Cases

Constipation	Sore Throat	Cases
Present.....	Present.....	15
Present.....	Not present.....	49
Not present.....	Not present.....	25
Not present.....	Present.....	4

TABLE 15—General Type of Family and Patient

Of 89 families, 8% are described as well-to-do; 27% as poor; 65% as medium.
Of 89 families, 85% are described as of previous good health.
Of 93 patients, 25% are described as of excellent previous health; 70% medium; 4% poor.

TABLE 16—Time Relation of Death to Onset of Disease

Of 14 deaths:

1 occurred on 1st day of the attack.
2 occurred on 2nd day of the attack.
1 occurred on 5th day of the attack.
1 occurred on 6th day of the attack.
2 occurred on 8th day of the attack.
1 occurred on 9th day of the attack.
1 occurred on 11th day of the attack.
1 occurred on 13th day of the attack.
1 occurred on 15th day of the attack.
2 deaths, date of onset of disease not given.

TABLE 17—Time Relation of Death to Paralysis

Of 14 deaths:

2 occurred on same day as onset of paralysis.
1 occurred on 1st day after onset of paralysis.
1 occurred on 2nd day after onset of paralysis.
2 occurred on 3rd day after onset of paralysis.
2 occurred on 4th day after onset of paralysis.
1 occurred on 5th day after onset of paralysis.
2 occurred on 10th day after onset of paralysis.
3 deaths, date of onset of paralysis not given.

TABLE 18—Indicating Alleged Human Sources of Infection for Primary Cases

Total primary cases	*81
Attributed to direct contact with other cases	23
Through a third party	4
Attending school where other cases developed	1
Playing with children then well but later sick	0
Other children sick in neighborhood	4
Apartments connected with other apartments, child sick	0
	32
Not connected by history with previous cases	49

*—At school when taken ill, total 15.

The distribution of endemic poliomyelitis and of cerebrospinal meningitis in the years of 1914 and 1915 is shown on the accompanying maps, while a separate map shows the cases of the "St. Cloud" epidemic.

It is to be regretted that the State Board of Health has no funds with which to pay for long distance telephone messages relative to certain notifiable diseases. If it were possible for physicians to telephone to the Division of Preventable Diseases without expense to themselves they would report cases and suspected cases when they first see them and an investigation would be possible, whereas many suspected cases are not now reported and many fatal cases are first reported by death certificate.

The first table shows the 1914 and 1915 poliomyelitis cases and deaths as they occurred, but complete histories were obtained from only ninety-three paralyzed cases.

The second table gives the age and sex of reported poliomyelitis cases and deaths in 1914 and 1915.

1914 AND 1915 REPORTED POLIOMYELITIS CASES AND DEATHS BY COUNTIES

County	Year	Jan. C.-D.	Feb. C.-D.	Mar. C.-D.	April C.-D.	May C.-D.	June C.-D.	July C.-D.	Aug. C.-D.	Sept. C.-D.	Oct. C.-D.	Nov. C.-D.	Dec. C.-D.	1914 C.-D.	1915 C.-D.
Anoka.....	1914														1-1
	1915	1-1													4-0
Beltrami.....	1914									3-0				2-1	
	1915	1-0													18-1
Benton.....	1914	1-1						1-0		7-1	4-0				1-1
	1915							6-0							1-1
Big Stone.....	1914							1-1			2-0	1-0		3-0	1-1
Blue Earth.....	1914	1-1													1-1
	1915														1-1
Cass.....	1914														1-1
	1915	1-1													1-1
Chisago.....	1914						1-1								1-1
	1915						1-1								1-1
Cottonwood.....	1914														1-0
	1915														3-1
Dakota.....	1914														1-0
	1915														1-0
Hennepin.....	1914							1-0	0-1						1-0
	1915							1-1							3-1
Hubbard.....	1914														1-0
	1915														1-0
Kanabec.....	1914														1-0
	1915														1-0
Koochiching.....	1914	3-1													3-1
	1915														1-0
Lake.....	1914														1-1
	1915									1-0	0-1				1-0
Lyon.....	1914														1-0
	1915														1-0
Marshall.....	1914														1-0
	1915														1-0
Martin.....	1914														1-1
	1915														10-0
Mille Lacs.....	1914														11-2
	1915														
Morrison.....	1914														
	1915														

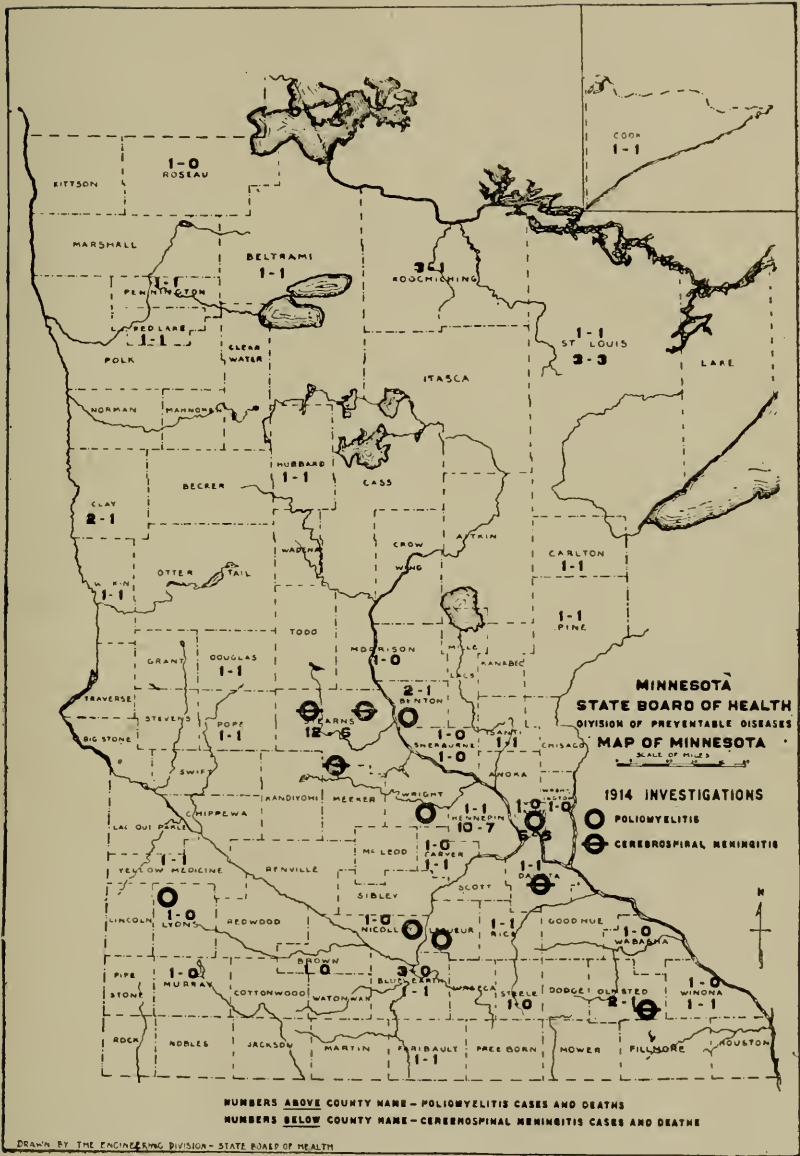
"C"—Cases; "D"—Deaths.

*—Duration not given; counted as case in month in which death occurred.

1914 AND 1915 REPORTED POLIOMYELITIS CASES AND DEATHS BY COUNTIES—Continued

County	Year	Jan. C.-D.	Feb. C.-D.	Mar. C.-D.	April C.-D.	May C.-D.	June C.-D.	July C.-D.	Aug. C.-D.	Sept. C.-D.	Oct. C.-D.	Nov. C.-D.	Dec. C.-D.	1914 C.-D.	1915 C.-D.
Murray.....	1914							1-0					1-0		
Murray.....	1915												1-0		
Nicollet.....	1914														
Nicollet.....	1915											1-0			
Norman.....	1914														
Norman.....	1915								0-1					1-1	
Olmsted.....	1914								1-0	1-1			1-1	2-1	
Olmsted.....	1915														
Pennington.....	1914	1-1								1-1			1-1		
Pennington.....	1915														
Pine.....	1914														
Pine.....	1915														
Ramsey.....	1914							1-0					1-0	1-1	
Ramsey.....	1915														
Renville.....	1914								1-0				1-1	2-0	
Renville.....	1915												1-0	2-0	
Rice.....	1914				1-1				2-0				1-0		
Rice.....	1915									1-0					
Roseau.....	1914														
Roseau.....	1915														
St. Louis.....	1914			1-1									1-1	1-1	
St. Louis.....	1915														
Sherburne.....	1914				1-0								1-0	4-0	
Sherburne.....	1915														
Stearns.....	1914								3-0		1-0				
Stearns.....	1915														
Wabasha.....	1914	1-0							11-0	20-2	7-1	7-1	1-0	45-4	
Wabasha.....	1915														
Washington.....	1914														
Washington.....	1915														
Watsonwan.....	1914									1-0				1-0	
Watsonwan.....	1915														
Winona.....	1914	1-0											1-0	1-0	
Winona.....	1915														
Wright.....	1914														
Wright.....	1915														
Yellow Medicine.....	1914	1-1							1-0	2-1			1-1	3-1	
Yellow Medicine.....	1915														
Total.....													22-8	122-22	

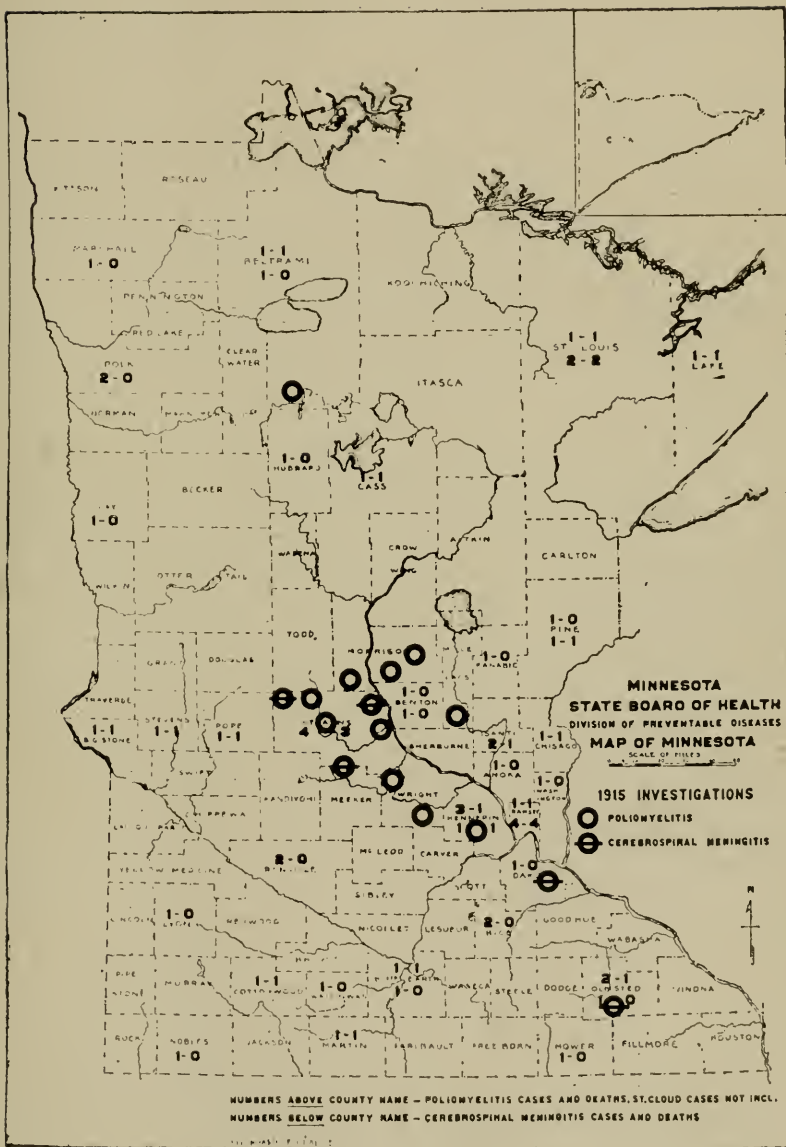
"C"—Cases; "D"—Deaths.



DRAWN BY THE ENGINEERING DIVISION - STATE BOARD OF HEALTH

POLIOMYELITIS
Sex and Age of Reported Cases and Deaths

Age	1914						1915					
	Total		Males		Females		Total		Males		Females	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
Under 1.....	3	3	2	2	1	1	11	5	7	2	4	3
1.....	1	1	.....	.....	1	1	11	3	11	1	5	2
2.....	2	1	.....	.....	2	1	12	.....	6	.....	5	.....
3.....	1	1	1	1	.....	.....	12	.....	4	.....	4	.....
4.....	3	.....	2	.....	1	.....	19	1	6	1	6	.....
5.....	3	1	3	1	.....	.....	6	.....	4	.....	5	.....
6.....	1	.....	1	.....	.....	.....	7	1	3	.....	3	.....
7.....	4	1	2	.....	5	1
8.....	2	.....	2	.....	.....	.....	4	3	4	1	2	.....
9.....	3	.....	3	.....	.....	.....	4	.....	3	.....	1	.....
10.....	4	.....	1	.....	3	.....
11.....	4	.....	1	.....	1	.....
12.....	1	.....	1	.....	.....	.....
13.....	1	.....	.....	.....	.....	.....
14.....	6	3	5	3	1	.....
15.....	2	1	2	1	1	.....
16.....	2	1	2	1	.....	.....
17.....	1	.....	.....	.....	.....	.....
18.....	5	1	3	.....	2	.....
19.....	2	.....	2	.....	2	.....
20.....	1	.....	1	.....	.....	.....	2	1	.....	.....	1	.....
21.....	1	.....	1	.....	.....	.....
22.....	1	1	1	1	.....	.....	.....	.....	.....	.....	.....	.....
23.....	1	.....	1	.....	.....	.....
24.....	2	.....	2	.....	.....	.....
25.....	1	.....	1	.....	.....	.....	1	.....	1	.....	.....	.....
26.....	1	.....	.....	.....	.....	.....
27.....	1	.....	1	.....	.....	.....
28.....	1	.....	.....	.....	.....	.....
29.....	2	.....	1	.....	.....	.....
30.....	1	.....	1	.....	.....	.....
31.....	1	.....	.....	.....	.....	.....
32.....	1	.....	.....	.....	.....	.....
33.....	1	.....	.....	.....	.....	.....
34.....	1	.....	.....	.....	.....	.....
35.....	1	.....	.....	.....	.....	.....
36.....	1	.....	.....	.....	.....	.....
37.....	1	.....	.....	.....	.....	.....
38.....	1	.....	.....	.....	.....	.....
39.....	1	.....	.....	.....	.....	.....
40.....	1	.....	.....	.....	.....	.....
41.....	1	.....	.....	.....	.....	.....
42.....	1	.....	.....	.....	.....	.....
43.....	1	.....	.....	.....	.....	.....
44.....	1	.....	.....	.....	.....	.....
45.....	1	.....	.....	.....	.....	.....
46.....	1	.....	.....	.....	.....	.....
47.....	1	.....	.....	.....	.....	.....
48.....	1	.....	.....	.....	.....	.....
49.....	1	.....	.....	.....	.....	.....
50.....	1	.....	.....	.....	.....	.....
51.....	1	.....	.....	.....	.....	.....
52.....	1	.....	.....	.....	.....	.....
53.....	1	.....	.....	.....	.....	.....
54.....	1	.....	.....	.....	.....	.....
55.....	1	.....	.....	.....	.....	.....
56.....	1	.....	.....	.....	.....	.....
57.....	1	.....	.....	.....	.....	.....
58.....	1	.....	.....	.....	.....	.....
59.....	1	.....	.....	.....	.....	.....
60.....	1	.....	.....	.....	.....	.....
61.....	1	.....	.....	.....	.....	.....
62.....	1	.....	.....	.....	.....	.....
63.....	1	.....	.....	.....	.....	.....
64.....	1	.....	.....	.....	.....	.....
65.....	1	.....	.....	.....	.....	.....
66.....	1	.....	.....	.....	.....	.....
67.....	1	.....	.....	.....	.....	.....
68.....	1	.....	.....	.....	.....	.....
69.....	1	.....	.....	.....	.....	.....
70.....	1	.....	.....	.....	.....	.....
71.....	1	.....	.....	.....	.....	.....
72.....	1	.....	.....	.....	.....	.....
73.....	1	.....	.....	.....	.....	.....
74.....	1	.....	.....	.....	.....	.....
75.....	1	.....	.....	.....	.....	.....
76.....	1	.....	.....	.....	.....	.....
77.....	1	.....	.....	.....	.....	.....
78.....	1	.....	.....	.....	.....	.....
79.....	1	.....	.....	.....	.....	.....
80.....	1	.....	.....	.....	.....	.....
Total.....	22	8	17	5	5	3	122	22	69	11	54	10



THE "ST. CLOUD" POLIOMYELITIS EPIDEMIC OF 1915
INTRODUCTION.

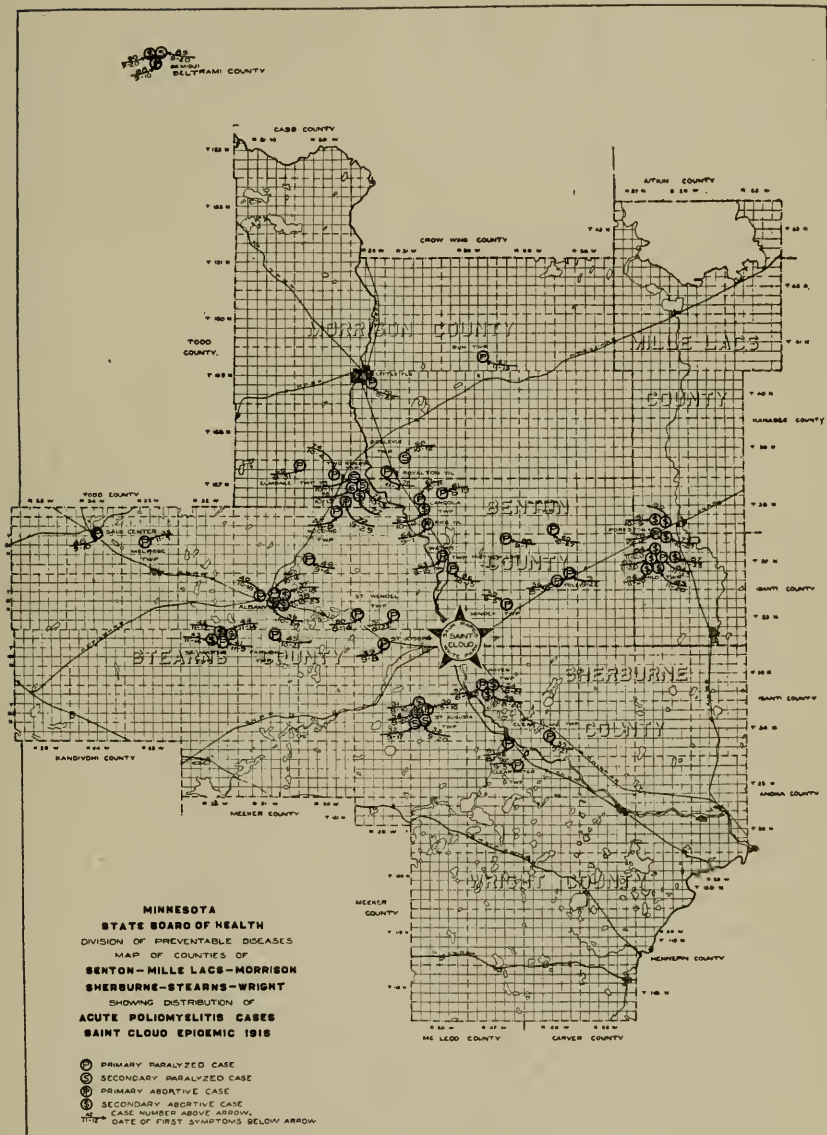
During eight years ending December 31, 1914, **fifteen cases** were reported in Stearns County, five being in St. Cloud. In Wright County on the south, eleven cases occurred, east in Sherburne County one case and north-east in Morrison County one case occurred. One case investigated by **Dr. W. P. Greene** developed first symptoms August 7, 1914, in Sauk Center, Benton County, adjoining East St. Cloud.

Stearns County has a population of about 50,000. St. Cloud is the county seat, with a population of 11,345. The Mississippi River divides the city into East St. Cloud, Benton County with about 2,000 population, and St. Cloud proper. The main line of the Northern Pacific Railway runs through East St. Cloud, north and south. The Great Northern Railway main trunk lines, one east and one west of the Mississippi, meet at St. Cloud and run west, while the Duluth-Willmar-Sioux Falls branch passes through both East St. Cloud and St. Cloud, northeast and southwest. An excellent system of highways affords easy access to St. Cloud from a rich agricultural district containing about 200,000 people. A State Normal School with about 450 students and the State Reformatory, with about 1,500 inmates, are situated at St. Cloud. The city is noted for its granite quarries.

EPIDEMIC OF 1915.

In St. Cloud there are fifteen resident physicians, but poliomyelitis cases were present more than a month before the local health officer or the State Board of Health was notified. A physician of a nearby village reported the first case and upon investigation it was found that one St. Cloud physician had seen nine cases, but none had been reported, therefore no quarantine. As a rule, the physicians had failed to impress the afflicted families with the necessity for isolation of the patient in a screened room and for the disinfection of the nose, throat, bowel and bladder discharges, etc. Indeed, certain families stated that their physicians had advised them that the patients might attend school and go about in public as soon as able.

The onset of symptoms in the **earliest case** found was **August 8, 1915**. This case was in East St. Cloud. The first symptoms of the **last case** in the epidemic occurred **November 23, 1915**, in Milo township, Mille Lacs county. The epidemic began before schools opened at the season when picnics, lawn parties and fairs are held. Every case and suspected case was investigated by Dr. W. P. Greene, who collected the epidemiological data from the family of the patient, from attending physicians, and others, and carefully checked such data for errors before preparing this report. **Thirty-two** sanitary districts in seven counties were involved, as follows: (See map on opposite page.)



County	Number Cases	Paralyzed	Abortive	Remarks
Beltrami.....	3	1	2	These were in Bemidji, but were exposed in St. Cloud. Three of these were in Sauk Rapids V.
Benton.....	18	17	1	
Mille Lacs.....	10	2	8	St. Cloud had 22 cases, 18 paralyzed; 4 abortive.
Morrison.....	10	8	2	
Sherburne.....	3	1	2	
Stearns.....	46	33	13	
Wright.....	2	2	0	
Total.....	92	64	28	

36 or 56% of the paralyzed were under 5 years of age (20 males; 16 females).

16 were between the ages of 6 and 10 (6 males; 10 females).

52 or 81% were under 10 years of age.

7 were between 11 and 15 years (6 males; 1 female).

1 was 20 years (female).

4 were male adults.

The oldest case was 28 years; the youngest was 9 months.

Of the 7 fatal cases, 2 were 6 years old; 1 was 8; 1 was 9; 2 were 14; 1 was 20.

The mortality rate, based on all cases, including non-paralyzed, was 7.9 per cent.

As a basis for diagnosis flaccid paralysis was regarded as essential for frank cases of poliomyelitis. Non-paralyzed cases having the same symptoms as frank cases, e. g., fever, headache, constipation, vomiting, with pain in back of neck or under the knees, or in arms and legs, when associated with frank cases, were regarded as poliomyelitis.

The interval between first symptoms of "primary" and "assumed secondary" cases varies from a few hours to 18 days. Sixteen or 69 per cent of the 23 "assumed secondary" cases developed three to ten days after the "primary" case to which they were exposed. Three cases developed on the fourth day; six on the tenth day; two on the third day, and two on the twelfth day following their respective "primary" cases.

It is interesting to note that one non-paralyzed case had played at a neighbor's where later three paralyzed cases developed. Six of the "assumed secondaries" received their exposure through a "primary" case outside of the family. One non-paralyzed case was taken ill while working on a farm where a common drinking cup was used. Twelve days later the manager of the farm developed paralysis of both legs, both arms and of the respiratory muscles. The fathers of two paralyzed cases worked in the same polishing room at one of the quarries, and used a common drinking cup. The father of another paralyzed case had visited a home where there was a non-paralyzed case. Four cases were taken ill while attending school. Two cases were taken ill soon after attending a picnic.

Indications of spread of poliomyelitis by contact were obtained during the St. Cloud epidemic. Association between paralyzed and non-paralyzed cases was carefully followed up. Indefinite information was noted about certain cases, possibly non-paralyzed poliomyelitis, yet not included here because such association could not be proved. It was impossible to get permission to perform lumbar puncture as an aid to diagnosis in mild cases, since the acute symptoms either had subsided before the epidemiologist arrived, or were so mild that puncture seemed uncalled for.

The following table shows the "primary" and "assumed secondary" cases which were found in the investigation of this epidemic:

Primary Cases	Assumed Secondary Cases
Beltrami Co.	
Bemidji City	
Mrs. M. J. C., 26, Sept. 10 (N-P).....	T. C., m. 2, Sept. 20 (P).
(Visited at St. Cloud, Sept. 1-16).	M. C., m. 1, Sept. 20 (N-P).
Benton Co.	
Langola Township	
G. C., m. 25, Oct. 8 (P).....	F. Y., f. 19 mos., Belview Township, Morrison Co Oct. 12 (P).
	R. C., m. 16, Oct. 12 (N-P).
Sauk Rapids Village	
J. W., m. 1, Sept. 19 (P).....	O. W., f. 3, Sept. 22 (P).
Watab Township	
G. S., f. 6, Sept. 5 (P).....	C. B., m. 8, Sept. 15, (P). Died Sept. 16; C. B. (Played 3 hrs. with C. B., Aug. 28). attended funeral of V. J. on Aug. 31, who died from meningitis of unknown origin).
	V. M., f. 7, Oct. 15, attended District School 2 same as C. B.).
Mille Lacs Co.	
Foreston Village	
Mrs. N. A., 39, Sept. 28 (N-P).....	N. A., m. 7, Oct. 12 (P).
	B. K., f. 5, (N-P).
B. A., f., 2, Sept. 28 (P).....	O. A., m. 8, Oct. 27 (N-P).
Milo Township	
G. O. St., m. 57, Nov. 20 (N-P).....	L. O., f. 18, Nov. 20 (P).
	J. O., f. 20, Nov. 20 (N-P).
	J. O., m. 7, Nov. 20 (N-P).
	G. O. Jr., m. 14, Nov. 23 (P).
	J. S., m. 22, Nov. 23 (N-P).
Morrison Co.	
Two Rivers Township	
S. P., f. 3, Sept. 29 (N-P).....	A. M., f. 6, Oct. 3 (P). Died Oct. 10.
	H. M., m. 2, Oct. 11 (P)
	F. G., f. 14, Oct. 13 (P).
	Mrs. F. M., 30, (N-P).
Sherburne Co.	
Haven Township	
M. G., f. 4, Aug. 20 (P).....	E. G., f. 10, Aug. 20 (N-P).
	A. G., m. 9, Aug. 21 (N-P).
Stearns Co.	
Albany Village	
S. R., m. 8, Oct. 18 (P).....	V. R., f. 4, Oct. 18 (N-P).
	R. R., m. 2, Oct. 23 (N-P).
	I. R., f. 8, Oct. 24 (N-P).
St. Cloud City	
C. V., m. 18, Aug. 30 (N-P).....	C. T., m. 23, Sept. 11 (P).
(Worked at pickle farm with 25 young people, where common drinking cup was used).	
H. W., m. 15, Aug. 19 (P).....	E. W. f. 13, Aug. 28 (N-P).
	I. W., f. 20, Aug. 31 (P). Died Sept. 7.
Waite Park City	
A. J., f. 9, Aug. 13 (N-P).....	B. K., f. 3, Sept. 1 (P).
St. Augusta Township	
L. L., f. 9, Sept. 10 (N-P).....	C. L., f. 6, Sept. 10 (N-P).
	A. L., f. 2, Sept. 17 (P).
	C. L., m. 9, Sept. 20 (N-P).
	E. L., f. 10, Sept. 20 (P).
St. Martin Township	
C. C., f. 4, Nov. 9 (P).....	N. C., m. 7, Nov. 12 (N-P).
	A. C., m. 1, Nov. 14 (N-P).
	P. C., m. 5, Nov. 14 (N-P).

(P) represents paralyzed case.

(N-P) represents non-paralyzed case.

CONCLUSIONS.

The epidemiological study of the "St. Cloud" epidemic of poliomyelitis apparently confirms the opinions of well known observers, that one way in which the disease is spread is by nose and throat discharges, through contact.

It appears that poliomyelitis, like epidemic cerebro-spinal meningitis, may be spread by **persons slightly ill** with the disease, or by **healthy "carriers,"** and like la grippe, seems to spread rapidly over large areas along the chief routes of travel. The spread of infection seems to be mainly through the mild types of the disease, since **direct connection between frank cases with paralysis is rarely found.** This epidemic died out when cold weather set in and it was only a forerunner of the widespread epidemic of 1916.

LIST OF INVESTIGATIONS 1914-1915

Poliomyelitis and Cerebrospinal Meningitis

Twenty-one epidemiological investigations of poliomyelitis and cerebrospinal meningitis were made in 33 different sanitary districts of 14 counties. This field work required 32 days.

County	Township-Village-City	Date	Index	Dr.
Beltrami	Bemidji City	Oct. 25-26	144, XV	(G)
Benton	Foley Village	See 173, XV		
	Langola Township			
	Rices Village	See 144, XV		
	Minden Township	See 123, XV		
	Sauk Rapids Village	Aug. 15-16	162, XIV	(G)
	St. Cloud City	See 106, XV		
Hennepin	Watab Township	See 158, XV		
	West Minneapolis Village	Oct. 11	130, XV	(G)
Le Sueur	Cleveland Township	Nov. 28	249, XIV	(G)
Lyon	Minneota Village	May 12-13	104, XIV	(G)
Mille Lacs	Foreston Village	See 144, XV		
	Milo Township	Dec. 6-7	170, XV	(G)
	Milo Township	Dec. 10	173, XV	(G)
Morrison	Belview Township			
	Elmdale Township			
	Little Falls City	See 144, XV		
	Buh Township	Nov. 28-29	164, XV	(G)
Nicollet	Two Rivers Township	Oct. 16	133, XV	(G)
	Lake Prairie Township	See 249, XIV		
Ramsey	St. Paul City	July 24	139, XIV	(G)
Sherburne	Horen Township	See 106, XV		
Stearns	Albany Village			
	Melrose Township			
	St. Martin Township	Nov. 22	158, XV	(G)
	St. Cloud City	Sept. 3-4-5	106, XV	(G)
	St. Cloud City			
	St. Joseph Village	Sept. 23-24	123, XV	(G)
Wright	Clearwater Township	Sept. 1-2	104, XV	(G)
	Clearwater Township	See 123, XV		
	Waverly Village	Sept. 15	179, XIV	(G)
Cerebrospinal Meningitis				
Dakota	Hastings City	Mar. 29	78, XIV	(G)
Olmsted	Pleasant Grove Township	Aug. 4	149, XIV	(G)
Stearns	Eden Valley Village	Mar. 26	75, XIV	(G)
	Eden Valley Village	Jan. 19	15, XV	(B)
	Melrose City			
	Grove Township	Mar. 1-2	40, XIV	(B)
	St. Wendell Township	Mar. 4-5	43, XIV	(G)

(B)—Dr. H. A. Burns.

(G)—Dr. W. P. Greene.

1914 STATEMENT EPIDEMIOLOGICAL FIELD WORK

In 1914 there were made 283 routine investigations in 266 different sanitary districts of 71 counties, and 10 special trips. The field work required 474 days and 44,693 miles of travel by rail, also several thousand miles by team or auto.

Quarter	Investigations					Days of Field Work				
	1st	2nd	3rd	4th	Total	1st	2nd	3rd	4th	Total
Tuberculosis.....	12	4	13	37	66	16	10	17	66	109
Typhoid fever.....	10	11	23	26	70	15	21	38	35	109
Diphtheria.....	11	2	9	13	35	16	8	15	21	60
Scarlet fever.....	18	16	6	8	48	29	29	8	11	77
Smallpox.....	18	8	4	4	34	22	13	3	5	43
Miscellaneous.....	10	4	10	6	30	18	9	20	12	59
Special.....			2	8	10			4	13	17
Total.....	79	45	67	102	293	116	90	105	163	474

Individual Field Work

Quarter	Investigations					Days of Field Work				
	1st	2nd	3rd	4th	Total	1st	2nd	3rd	4th	Total
A. J. Chesley.....	8	7	2	6	23	9	8	12	9	38
H. A. Burns.....	35	19	26	24	104	45	38	35	40	158
W. P. Greene.....	30	21	34	36	121	54	41	54	52	201
*H. G. Lampson.....	6	2	3	38	49	6	2	4	62	74
†A. R. Blakey.....	2	1			3	2	1			3

*—Deputy Health Officer, Rochester and Supervisor, Olmsted Co., appointed Epidemiologist September 15, 1914.

†—Special tuberculosis work.

Railway Mileage

Quarter	1st	2nd	3rd	4th	Total
A. J. Chesley	1,098	184	1,669	1,981	4,932
H. A. Burns	3,854	3,500	3,020	3,195	13,595
W. P. Greene	4,101	4,017	6,342	5,660	20,120
H. G. Lampson	36	.....	290	5,420	5,746
A. R. Blakey	148	178	.....	.....	326
	9,237	7,879	11,321	16,256	44,693

Requests for Investigations

These investigations were made as per the following requests:	
Local health authorities	126
Physicians not health officers	31
School authorities	14
State institutions	17
"Order of executive officer"—Usually requested by citizens who forbade use of names	93
Federal government	1
N. D. State board of Health	1
Total	283

1915 STATEMENT EPIDEMIOLOGICAL FIELD WORK

In 1915 there were made 188 routine epidemiological investigations in 208 different sanitary districts of 65 counties and 6 special trips.

The field work required 300 days, 29,364 miles of travel by rail and 2,561 by team or auto.

ROUTINE FIELD WORK WAS SUSPENDED FROM APRIL 1 TO AUGUST 1, 1915, ON ACCOUNT OF LACK OF FUNDS.

Quarter	Investigations					Days of Field Work				
	1st	2nd	3rd	4th	Total	1st	2nd	3rd	4th	Total
Tuberculosis	30	1	3	11	45	51	1	4	12	68
Typhoid fever	9	2	5	13	29	15	2	9	18	44
Diphtheria	9	0	7	9	25	14	0	13	15	42
Scarlet fever	16	2	10	12	40	25	2	15	21	63
Smallpox	11	2	2	8	28	16	3	*	8	27
Miscellaneous	9	2	5	10	26	16	2	10	18	46
Special trips	2	1	1	2	6	2	1	4	3	10
Total	86	10	33	65	194	139	11	55	95	300

*Time charged to another disease.

Field Work of Individuals

Quarter	Investigations					Days of Field Work				
	1st	2nd	3rd	4th	Total	1st	2nd	3rd	4th	Total
A. J. Chesley	4	0	1	2	7	4	0	4	2	10
H. A. Burns	35	2	14	27	78	43	3	22	47	115
W. P. Greene	24	6	18	35	83	39	6	29	41	116
H. G. Lampson	23	2			25	53	2			55
†C. C. Pratt				1	1				4	4

Quarter	Railway Mileage					Team or Auto Mileage					Grand Total
	1st	2nd	3rd	4th	Total	1st	2nd	3rd	4th	Total	
A. J. Chesley	1,251		438	410	2,099	4				4	2,103
H. A. Burns	6,286	60	2,743	4,507	13,596	290		211	421	922	14,518
W. P. Greene	3,574	398	2,077	3,987	10,036	418	54	172	567	1,211	11,247
†H. G. Lampson	3,573	60			3,633	312	12			324	3,957
†C. C. Pratt									100	100	100
Total	14,684	518	5,258	8,904	29,364	1,024	66	383	987	2,561	31,925

†—Discharged on account of lack of funds July 31, 1915.

‡—Bacteriologist Mankato Branch Laboratory.—Special investigations.

Requests for routine epidemiological investigations in 1915.

By local health officers	66
Physicians not health officers	46
School authorities	15
State institutions	3
"By order of executive officer"—Usually requested by citizens who forbade use of names	55
County commissioners	1
Humane society	1
State hotel inspector	1
Total routine investigations	188

FIELD INVESTIGATIONS—JANUARY 1, 1914 TO DECEMBER 31, 1915

County	Township-Village-City	Subject	Date	Index
Aitkin.....	Hazelton Twp.....	Scarlet fever.....	Mar. 5.....	54, XV
	Hill City V.....	Typhoid fever.....	Nov. 22-23.....	245, XIV
	Hill City V.....	Scarlet fever.....	Nov. 22-23.....	246, XIV
	Salo Twp.....	Smallpox.....	Dec. 25.....	36, XIV
	Verdon Twp.....	Syphilis.....	Nov. 15-16, 17-18-19-20-21.....	240, XIV
Anoka.....	Anoka C. (State Asylum).....	Dysentery.....	Dec. 7.....	256, XIV
	Anoka C. (State Asylum).....	Typhoid fever and dysentery.....	Nov. 2.....	225, XIV
	Anoka C.....	Tuberculosis.....	Oct. 15.....	201, XIV
	Anoka C., Ramsey Twp.....	Typhoid fever.....	See 201.....	202, XIV
	Anoka Twp.....	Typhoid fever.....	June 3.....	115, XIV
	Columbia Heights V.....	Scarlet fever.....	Mar. 30.....	79, XIV
	Columbia Heights V.....	Scarlet fever.....	Mar. 28.....	77, XIV
	Columbia Heights V.....	Diphtheria.....	Feb. 21.....	32, XIV
	Columbia Heights V.....	Smallpox.....	June 23.....	124, XIV
	Fridley Twp.....	Scarlet fever.....	Feb. 3.....	17, XIV
	Fridley Twp.....	Diphtheria.....	Oct. 19.....	205, XIV
	Becker.....	Fridley Twp.....	Diphtheria.....	Sept. 14.....	177, XIV
Cuba Twp.....		Tuberculosis.....	Dec. 17.....	264, XIV
Cuba Twp.....		Tuberculosis.....	Nov. 9.....	239, XIV
Detroit C.....		Typhoid fever.....	Jan. 22-23.....	22, XV
Lake Park V.....		Tuberculosis.....	Nov. 8.....	234, XIV
Lake Park Twp.....		Typhoid fever.....	Nov. 16.....	155, XV
Spring Creek Twp.....		Susp. Trachoma.....	Oct. 4.....	190, XIV
Spring Creek Twp.....		Typhoid fever.....	Oct. 5-6.....	191, XIV
Beltrami.....	Alaska Twp.—Maple Ridge Twp.....	Diphtheria.....	Oct. 7-8.....	194, XIV
	Bemidji C.....	Trachoma.....	Mar. 18.....	61, XIV
	Bemidji C.....	Tuberculosis.....	July 22.....	134, XIV
	Bemidji C.....	Tuberculosis.....	Aug. 24-25.....	163, XIV
	Bemidji C.....	Tuberculosis.....	Oct. 27.....	145, XIV
	Bemidji C.....	Poliomyelitis.....	See 144, XV.....	
	Bemidji C.....	Typhoid fever.....	See 146, XV.....	
	Bemidji C.....	Diphtheria.....	Nov. 30.....	165, XIV
	Cormant Twp.—Kelliher V.....	Trachoma.....	Feb. 28-Mar. 1-2.....	56, XV
	Eckles Twp.....	Tuberculosis.....	July 21.....	135, XIV
	Funkley V.....	Scarlet fever.....	June 16-17-18.....	120, XIV
	Funkley V.....	Chickenpox.....	July 21.....	133, XIV
	Myhre Twp.....	Tuberculosis.....	Mar. 20.....	75, XV
	Northwood Twp.—Spruce Valley Twp.....	Tuberculosis.....	Mar. 4-5.....	58, XV
	Benton.....	Foley V.....	Poliomyelitis.....	Dec. 10.....	173, XV
Foley V.....		Tuberculosis.....	Dec. 11.....	174, XV
Langola Twp.—Rices V.....		Poliomyelitis.....	Oct. 25-26.....	144, XV
Minden Twp.....		Poliomyelitis.....	See 123, XV.....	
St. Cloud C.....		Poliomyelitis.....	See 106, XV.....	
Sauk Rapids V.....		Poliomyelitis.....	Aug. 15-16.....	162, XIV
Big Stone.....	Sauk Rapids Twp.....	Smallpox.....	Sept. 25.....	124, XV
	Watab Twp.....	Poliomyelitis.....	See 158, XV.....	
	Malta Twp.....	Typhoid fever.....	Oct. 26.....	142, XV
Blue Earth.....	Moonshine Twp.....	Typhoid fever.....	June 12-13-14.....	118, XIV
	Amboy V.....	Tuberculosis.....	May 25-29, June 5-6.....	112, XIV
	Beauford Twp.....	Tuberculosis.....		
	Butternut Valley Twp.....	Tuberculosis.....		
	Cambria.....	Tuberculosis.....		
	Danville Twp.....	Tuberculosis.....	Oct. 4-11.....	192, XIV
	Decoria Twp.....	Tuberculosis.....		
	Garden City Twp.....	Tuberculosis.....		
	Garden City V.....	Tuberculosis.....		
	Good Thunder V.....	Tuberculosis.....	Oct. 18-23.....	204, XIV
	Garden City V.....	Tuberculosis.....	Dec. 15.....	180, XV
	Lincoln Twp.....	Tuberculosis.....	Dec. 15.....	180, XV
	Jamestown—Le Roy Twp.....	Tuberculosis.....	Oct. 15.....	213, XIV
	Judson Twp.....	Tuberculosis.....	Oct. 21.....	218, XIV
	Lake Crystal V.....	Tuberculosis.....	Oct. 14.....	200, XIV
	Le Roy Twp.....	Tuberculosis.....		
	Lime Twp.....	Tuberculosis.....		
	Lincoln Twp.....	Tuberculosis.....		
	Lvra Twp.....	Tuberculosis.....		
	McPherson Twp.....	Tuberculosis.....		
	Mapleton Twp.....	Tuberculosis.....	Oct. 16-17.....	214, XIV
	Mankato C.....	Tuberculosis.....		214, XIV
	Medo Twp.....	Tuberculosis.....		214, XIV
	Rapidan Twp.....	Tuberculosis.....		214, XIV
	Shelby Twp.....	Tuberculosis.....		214, XIV

FIELD INVESTIGATIONS—JANUARY 1, 1914 TO DECEMBER 31, 1915—Continued

County	Township-Village-City	Subject	Date	Index	
Blue Earth	South Bend Twp.	Tuberculosis			
	Sterling Twp.	Tuberculosis			
	Vernon Centre Twp.	Tuberculosis	Oct. 21	218, XIV	
Brown	Mankato C.	Smallpox	Aug. 26-27	101, XV	
	Cottonwood Twp.				
	New Ulm C.	Typhoid fever	Feb. 9-10-11-12	21, XIV	
	New Ulm C.	Typhoid fever	Jan. 27-28-29	15, XIV	
Carlton	New Ulm C.	Typhoid fever	June 7-8	117, XIV	
	Blackhoof Twp.	Smallpox	June 14	119, XIV	
	Carlton V.—Twin Lakes Twp.	Scarlet fever	Aug. 30-31	103, XV	
	Cloquet C.	Miscellaneous	See 153, XIV		
	Cloquet C.	Typhoid fever	May 10-11-12	102, XIV	
Carver	Cloquet C.	Smallpox	Feb. 26	37, XIV	
	Wrenshall Twp.	Smallpox	Nov. 29-30	250, XIV	
	Benton Twp.				
	Hancock Twp.	Typhoid fever	Dec. 28	277, XIV	
Cass	Hancock Twp.	Tuberculosis	Dec. 29	278, XIV	
	Watertown Twp.	Scarlet fever and measles	June 2	114, XIV	
	Pine River V.	Smallpox	Jan. 13-14	9, XV	
	State Sanatorium.	Miscellaneous	Aug. 28-29-30	166, XIV	
	State Sanatorium.	Special	July 13		
Chippewa	Unorganized Twps. L. 134, N. R. 29 W.	Tuberculosis	Dec. 18-19	267, XIV	
	Sparta Twp.	Tuberculosis	Sept. 25	184, XIV	
	Woods Twp.	Typhoid fever	Oct. 30	221, XIV	
Chisago	Fish Lake Twp.	Diphtheria	Dec. 30	283, XIV	
	Fish Lake Twp.	Diphtheria	Jan. 4	2, XV	
Clay	Barnesville C.	Scarlet fever	Nov. 2-3	148, XV	
	Elkton Twp.				
	Elmwood Twp.	Diphtheria	Dec. 2-3-4	252, XIV	
	Glyndon V.				
	Flowing Twp.	Typhoid fever	Jan. 9-10-11	5, XIV	
	Goose Prairie Twp.				
	Georgetown Twp.	Diphtheria	Sept. 16-17	117, XV	
	Viding Twp.				
	Goose Prairie Twp.	Whooping cough	Sept. 25-26	185, XIV	
	Moorhead C.	Tuberculosis	Dec. 16	263, XIV	
Clearwater	Spring Prairie Twp.	Diphtheria	Mar. 25-26	83, XV	
	Greenwood Twp.	Tuberculosis	Mar. 16-17-18	58, XIV	
Cottonwood	Delton Twp.	Scarlet fever	Nov. 12	238, XIV	
	Highwater Twp.	Typhoid fever	Sept. 29	188, XIV	
	Highwater Twp.	Tuberculosis	Jan. 18-19	18, XV	
Crow Wing	Jeffers V.	Scarlet fever	Oct. 20-21	138, XV	
	Storden Twp.	Smallpox	Feb. 16	28, XIV	
	Storden Twp.	Diphtheria	Feb. 17	29, XIV	
	Brainerd C.	Typhoid fever	Jan. 10	6, XIV	
	Crosby V.	Typhoid fever	Jan. 11	7, XIV	
	Deerwood Twp.	Tuberculosis	Oct. 7	127, XV	
	Riverton V.	Tuberculosis	Mar. 5	55, XV	
	Seminole Twp.	Scarlet fever	Jan. 14	10, XV	
	Hampton V.	Special	Mar. 12		
	Hampton V.	Typhoid fever	Jan. 15	8, XV	
Dakota	Hastings C.	C. Sp. Meningitis	Mar. 29	78, XIV	
	Invergrove Twp.	Scarlet fever	April 6	85, XIV	
	Mendota Twp.	Scarlet fever	June 18	123, XIV	
	Egan Twp.				
	Mendota Twp.	Scarlet fever	July 3	125, XIV	
	Mendota Twp.	Scarlet fever	July 20	132, XIV	
	Mendota Twp.	Scarlet fever	July 18	131, XIV	
	Rich Valley V.	Typhoid fever	Aug. 31	167, XIV	
	Rich Valley V.	Typhoid fever	Nov. 7	231, XIV	
	South St. Paul C.	Scarlet fever	Mar. 20	65, XIV	
Dodge	South St. Paul C.	Dysentery	Oct. 24	212, XIV	
	South St. Paul C.	Dysentery	Oct. 29	222, XIV	
	South St. Paul C.	Chickenpox	June 3	90, XV	
	West St. Paul V.	Typhoid fever	Oct. 20	206, XIV	
	Ripley Twp.	Scarlet fever	Mar. 24-25-26	80, XV	
	Douglas	Lund Twp.	Tuberculosis	Mar. 18	60, XIV
		Lund Twp.	Tuberculosis	Nov. 10	235, XIV
	Faribault	Elmore V.			
		Elmore Twp.	Smallpox	April 28-29	87, XV
	Fillmore	Mabel V.	Scarlet fever	Jan. 26-27	12, XIV
Mabel V.		Scarlet fever	Mar. 26-27-28	76, XIV	
Newburg Twp.		Typhoid fever	Jan. 28	13, XIV	
Freeborn	Albert Lea C.	Typhoid fever	July 25	140, XIV	
	Albert Lea C.	Diphtheria	Nov. 16-17-18	241, XIV	
	Albert Lea C.	Special	Dec. 15-16		

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County	Township-Village-City	Subject	Date	Index	
Freeborn	Albert Lea C	Typhoid fever	Mar. 10-11	64, XV	
	Albert Lea C	Scarlet fever	Mar. 10-11	65, XV	
	Albert Lea C	Typhoid fever	Mar. 16-20	73, XV	
Goodhue	Bancroft Twp.	Scarlet fever	Dec. 12-13	175, XV	
	Hartland V.	Susp. Tuberculosis	Mar. 24	68, XIV	
	Mineola Twp.	Typhoid fever	Aug. 24-25	99, XV	
	Pine Island Twp.		Aug. 26-27-28	102, XV	
	Roscoe Twp.	Typhoid fever	Aug. 26-27-28	102, XV	
	Red Wing C.		Aug. 26-27-28	102, XV	
	Stanton Twp.	Tuberculosis	Nov. 4	227, XIV	
	Yasa Twp.	Susp. Leprosy	Sept. 1	168, XIV	
	Grant	Warsaw Twp.	Tuberculosis	Oct. 6-7	128, XV
		Roseville Twp.	Smallpox	Feb. 19	46, XV
Hennepin	Brooklyn Center V.	Tuberculosis	Aug. 14	160, XIV	
	Brooklyn Center V.	Diphtheria	Dec. 20	268, XIV	
Isanti	Brooklyn Center V.	Diphtheria	Dec. 21	270, XIV	
	Brooklyn Center V.	Scarlet fever	Sept. 11	111, XV	
	Champlin Twp.	Typhoid fever	See 202, XIV		
	Crystal Lake Twp.	Diphtheria	Dec. 23	275, XIV	
	Crystal Lake Twp.	Typhoid fever	May 19-20	110, XIV	
	Eden Prairie Twp.	Scarlet fever	Dec. 29	280, XIV	
	Eden Prairie Twp.	Scarlet fever	Jan. 6-7	3, XV	
	Edina V.		Jan. 6-7	3, XV	
	Edina V.	Jaundice	Nov. 16-21	162, XIV	
	Excelsior V.	Minneapolis C.	Tuberculosis	Mar. 20	64, XIV
	Golden Valley V.	Golden Valley V.	Diphtheria	Mar. 12	52, XIV
	Golden Valley V.	Golden Valley V.	Diphtheria	Mar. 14	55, XIV
	Independence Twp.	Independence Twp.	Leprosy	Mar. 13	54, XIV
	Independence Twp.	Independence Twp.	Scarlet fever	Mar. 13	53, XIV
	Independence Twp.	Independence Twp.	Scarlet fever	April 15	89, XIV
	Minnetrista Twp.	Minnetrista Twp.	Smallpox	Mar. 18-19	62, XIV
	Minneapolis C.	"U. of M."	Smallpox	Mar. 25	71, XIV
	Minneapolis C.	"U. of M."	Smallpox	Feb. 14	26, XIV
	Minneapolis C.	"U. of M."	Smallpox	Nov. 20	242, XIV
	Minneapolis C.	"U. of M."	Typhoid fever	Nov. 20	242, XIV
	Minneapolis C.	Elliot Hosp.	Smallpox	April 8-9-13-14	82, XIV
	Minneapolis C.	Elliot Hosp.	Typhoid fever	April 6	83, XIV
	Minneapolis C.	Elliot Hosp.	Scarlet fever	May 17	107, XIV
	Minneapolis C.	Soldiers' Home	Tuberculosis	July 14	161, XIV
	Minneapolis C.	Thomas Hosp.	Tuberculosis	July 22	136, XIV
	Minneapolis C.	Minneapolis C.	Diphtheria	Mar. 11	50, XIV
	Minneapolis C.	Minneapolis C.	Typhoid fever	Aug. 10	155, XIV
	Minneapolis C.	Minneapolis C.	Pellagra	April 8, 1915	
	Minneapolis C.	Minneapolis C.	Leprosy	April 12, 1915	
	Minneapolis C.	Minneapolis C.	Miscellaneous	April 27	86, XV
	Minneapolis C.	Minneapolis C.	Tuberculosis	Sept. 10	110, XV
	Minneapolis C.	Minneapolis C.	Typhoid fever	See 161, XV	
	Richfield V.	Richfield V.	Smallpox	Dec. 9	171, XV
	Mound V.	Mound V.		Dec. 9	171, XV
	Orono Twp.	Orono Twp.	Smallpox	Jan. 23	21, XV
	Orono Twp.	Orono Twp.	Smallpox	Jan. 26-27	24, XV
	Orono Twp.	Orono Twp.	Scarlet fever	Nov. 12	153, XV
	Orono Twp.	Orono Twp.	Smallpox	Nov. 18	157, XV
	Orono Twp.	Orono Twp.	Smallpox	Dec. 4	168, XV
	Osseo V.	Osseo V.	Diphtheria	Jan. 13	7, XV
	Plymouth Twp.	Plymouth Twp.	Typhoid fever	July 4	126, XIV
	Plymouth Twp.	Plymouth Twp.	Diphtheria	Mar. 19	72, XV
	Plymouth Twp.	Plymouth Twp.	Diphtheria	Aug. 16	96, XV
	Robbinsdale V.	Robbinsdale V.	Typhoid fever	Mar. 7	45, XIV
	St. Louis Park V.	St. Louis Park V.	Chickenpox	Feb. 21	33, XIV
West Minneapolis V.	West Minneapolis V.	Typhoid fever	Sept. 14	178, XIV	
West Minneapolis V.	West Minneapolis V.	Scarlet fever	Oct. 26	216, XIV	
West Minneapolis V.	West Minneapolis V.	Whooping cough	Oct. 26	216, XIV	
West Minneapolis V.	West Minneapolis V.	Scarlet fever	Oct. 28	220, XIV	
West Minneapolis V.	West Minneapolis V.	Special	Feb. 4		
West Minneapolis V.	West Minneapolis V.	Poliomyelitis	Oct. 11	130, XIV	
Stanford Twp.	Stanford Twp.	Scarlet fever	Dec. 3	251, XIV	
Wyanette Twp.	Wyanette Twp.	Diphtheria	Mar. 10-11-12	61, XV	
Wyanette Twp.	Wyanette Twp.	Diphtheria	Aug. 24-25	98, XV	
Bovey V.	Bovey V.	Miscellaneous	Aug. 3-9	153, XIV	
Coleraine V.	Coleraine V.		Aug. 3-9	153, XIV	
Grand Rapids V.	Grand Rapids V.		Aug. 3-9	153, XIV	
Holman V.	Holman V.		Aug. 3-9	153, XIV	
Marble V.	Marble V.		Aug. 3-9	153, XIV	
Taconite V.	Taconite V.				

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County	Township-Village-City	Subject	Date	Index
Itasca.....	Cohasset V.....	Diphtheria.....	Oct. 17-18-19.....	134, XIV
	Grand Rapids V.....			
	Deer River V.....	Miscellaneous.....	Oct. 30.....	223, XIV
Jackson.....	Deer River Twp.....	Scarlet fever.....	April 24-25-26-27.....	97, XV
	Otenagon Twp.....			
	Alpha V.....	Typhoid fever.....	Jan. 5-6.....	4, XV
	Alpha V.....	Typhoid fever.....	Mar. 12.....	66, XV
Kanabec.....	Jackson V.....			
	Arthur Twp.....	Scarlet fever.....	June 16.....	122, XIV
Kandiyohi.....	Comfort Twp.....	Diphtheria.....	Aug. 7-8-14.....	152, XIV
	Mora V.....			
	Mora V.....	Scarlet fever.....	April 1-2-3.....	80, XIV
	Whitted Twp.....	Scarlet fever.....	April 6-7.....	86, XIV
	Whitted Twp.....	Tuberculosis.....	Oct. 5.....	193, XIV
	Whitted Twp.....	Tuberculosis.....	Dec. 30.....	281, XIV
	Whitted Twp.....	Tuberculosis.....	Oct. 11-12.....	199, XIV
	East Lake Lillian Twp.....	Diphtheria.....	Mar. 12-13.....	51, XIV
	Manre Twp.....	Smallpox.....	Feb. 26-27.....	39, XIV
	Kittson.....	Pennock V.....		
Willmar C.....		Miscellaneous.....	April 2-3.....	116, XIV
Willmar C.....		Diphtheria.....	Dec. 10-11.....	259, XIV
Willmar C.....		Diphtheria.....	Dec. 14-15.....	261, XIV
Koochiching.....	Bronson V.....			
	Jupiter Twp.....	Smallpox.....	April 20.....	92, XIV
	Hazleton Twp.....			
	Hallock V.....	Typhoid fever.....	May 29.....	92, XV
	Hampden Twp.....	Miscellaneous.....	April 18-19.....	91, XIV
	Poppleton Twp.....	Typhoid fever.....	April 21-22.....	93, XIV
	St. Vincent V.....	Leprosy.....	Feb. 17.....	45, XV
	Big Falls V.....	Scarlet fever.....	Sept. 12.....	113, XV
	Grand Falls Twp.....			
	International Falls C.....	Miscellaneous.....	Sept. 13.....	114, XV
Lake.....	Knife River V.....	Tuberculosis.....	Nov. 4-5.....	230, XIV
	Two Harbors C.....	Typhoid fever.....	Nov. 4-5.....	229, XIV
	Two Harbors Twp.....	Tuberculosis.....	June 15-16.....	121, XIV
	Two Harbors C.....	Scarlet fever.....	April 4-5.....	84, XIV
Le Sueur.....	Two Harbors C.....	Scarlet fever.....	Mar. 3-4.....	53, XV
	Cleveland Twp.....	Poliomyelitis.....	See 249, XIV	
	Cleveland Twp.....	Influenza.....	Nov. 26-27-29.....	163, XV
	Cleveland Twp.....	Typhoid fever.....	Oct. 26-27-30-31.....	167, XV
	Washington Twp.....			
	County Survey.....			
	Cordova Twp.....			
	Elysian V.....			
	Kasota Twp.....			
	Kasota V.....			
Lincoln.....	Le Sueur C.....	Tuberculosis.....	Feb. 9-Mar. 5.....	42, XV
	Le Sueur Center V.....			
	Montgomery C.....			
	New Prague C.....			
	Sharon Twp.....			
	Tyrone Twp.....			
	Waterville C.....			
	Le Sueur C.....	Typhoid fever.....	Oct. 24.....	211, XIV
	Le Sueur C.....	Tuberculosis.....	Mar. 13.....	68, XV
	New Prague C.....	Tuberculosis.....	Mar. 12.....	67, XV
Lyon.....	Waterville C.....	Smallpox.....	Nov. 23.....	247, XIV
	Waterville C.....	Smallpox.....	Jan. 14.....	12, XV
	Waterville Twp.....			
	Hendricks V.....	Typhoid fever.....	Dec. 10-11.....	258, XIV
Marshall.....	Hope Twp.....			
	Marshfield Twp.....	Scarlet fever.....	Dec. 8-9.....	257, XIV
	Shookatan Twp.....			
	Tyler V.....			
McLeod.....	Cottonwood V.....	Typhoid fever.....	April 28-29.....	98, XIV
	Custer Twp.....	Typhoid fever.....	Sept. 29.....	189, XIV
	Custer Twp.....	Diphtheria.....	Jan. 20-21-22.....	20, XV
	Lake Marshall Twp.....	Tuberculosis.....	Jan. 21-22.....	11, XIV
	Marshall C.....	Typhoid fever.....	July 28-29.....	141, XIV
	Minneota V.....	Poliomyelitis.....	May 12-13.....	104, XIV
Marshall.....	Minneota V.....	Scarlet fever.....	Mar. 7-8.....	63, XV
	Sherburne Twp.....	Scarlet fever.....	April 9-10-11.....	87, XIV
	Glencoe C.....			
	Hassan Valley Twp.....	Typhoid fever.....	Oct. 24.....	140, XV
Marshall.....	Helen Twp.....			
	Hassan Valley Twp.....	Tuberculosis.....	Oct. 27.....	143, XV
	Alma Twp.....	Diphtheria.....	Oct. 22.....	209, XIV
	Middle River Twp.....			

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Marshall	East Park Twp	Tuberculosis	Oct. 7-8	195, XIV	
	Holt Twp	Tuberculosis	Dec. 18-19	265, XIV	
	New Solum Twp	Smallpox	Jan. 30-31	16, XIV	
	Holt Twp	Typhoid fever	(See 208, XIV)		
	Nelson Park Twp	Diphtheria	Sept. 22-23	183, XIV	
	Wagner Twp				
	Wright Twp				
	Valley Twp	Tuberculosis	(See 58, XV)		
Martin	Elm Creek Twp	Tuberculosis	Mar. 24-25-26	81, XV	
Mecker	Darwin Twp	Diphtheria	Dec. 14	260, XIV	
	Eden Valley V	Smallpox	Jan. 11	6, XV	
	Forest City Twp	Tuberculosis	Dec. 23	272, XIV	
	Forest City Twp	Scarlet fever	Jan. 1-2	1, XV	
	Kingstown Twp	Tuberculosis	Mar. 25	73, XIV	
	Litchfield V	Diphtheria	Mar. 25	70, XIV	
	Manannah Twp	Tuberculosis	Mar. 26	74, XIV	
	Manannah Twp	Tuberculosis	July 24	138, XIV	
	Manannah Twp	Tuberculosis	Aug. 16	95, XV	
		Foreston V	Poliomyelitis	(See 144, XV)	
		Greenbush Twp	Typhoid fever	Aug. 5-6	150, XIV
		Milaca Twp	Leprosy	(See 35, XV)	
		Milo Twp	Typhoid fever	Feb. 4	37, XV
	Milo Twp	Poliomyelitis	Dec. 6-7	170, XV	
	Milo Twp	Poliomyelitis	(See 173, XV)		
	Princeton Twp	Diphtheria	(See 61, XV)		
	Waukon V	Tuberculosis	Feb. 3	35, XV	
Morrison	Belview Twp	Poliomyelitis	(See 144, XV)		
	Elmdale Twp				
	Little Falls C				
	Buh Twp	Poliomyelitis	Nov. 28-29	164, XV	
	Royalton V	Trachoma	Oct. 26	147, XV	
Mower	Two Rivers Twp	Diphtheria	July 21-22	137, XIV	
	Two Rivers Twp	Poliomyelitis	Oct. 16	133, XV	
	Austin C	Scarlet fever	Mar. 9-10-11	48, XV	
	Austin C	Tuberculosis	Oct. 26	215, XIV	
	Austin C	Diphtheria	Sept. 12-13-14	112, XV	
	Austin C	Diphtheria	Sept. 15-16-17	118, XV	
	Grand Meadow V	Scarlet fever	Feb. 10-11	22, XIV	
	Grand Meadow V	Scarlet fever	Mar. 20-21-22	66, XIV	
	Pleasant Valley Twp	Tuberculosis	Mar. 23	67, XIV	
		Belast Twp	Smallpox	July 15-16-17	130, XIV
Murray	Fulda V				
	Fulda V	Scarlet fever	July 15-16-17	128, XIV	
Nicollet	Courtland Twp	Typhoid fever	Feb. 9-10-11-12	21, XIV	
	Lafayette Twp				
	Lake Prairie Twp	Poliomyelitis	Nov. 28	249, XIV	
	North Mankato V	Scarlet fever	Aug. 26-27	100, XV	
	Oshawa Twp	Scarlet fever	Dec. 6	169, XV	
	St. Peter C	Miscellaneous	Jan. 13-14	9, XIV	
	St. Peter C	Pellagra	Feb. 10-11	38, XV	
	St. Peter C	Typhoid fever	(See 167, XV)		
		Brewster V	Tuberculosis	Mar. 26-27	82, XV
		Seward Twp	Smallpox	(See 130, XIV)	
Norman	Wilmont V	Smallpox	Jan. 15-16	13, XV	
	Fossum Twp	Smallpox	April 2-3	81, XIV	
	Gary V	Diphtheria	Sept. 14-15	115, XV	
Olmsted	Hendrum Twp	Smallpox	Mar. 18-19	74, XV	
	Byron V	German Measles	Mar. 24	72, XIV	
	Kalmar Twp				
	Caseade Twp	Scarlet fever	Feb. 25	44, XIV	
	Kalmar Twp	Smallpox			
	Dover Twp	Scarlet fever	April 20	94, XIV	
	Dover Twp	Scarlet fever	April 27	99, XIV	
	Dover Twp	Scarlet fever	July 10	129, XIV	
	Kalmar Twp	Chickenpox	Feb. 2	18, XIV	
	New Haven Twp	Typhoid fever	Aug. 3-4	148, XIV	
	Oronoco Twp				
	Oronoco Twp	Typhoid fever	July 29	144, XIV	
	Pleasant Grove Twp	C. Sp. Meningitis	Aug. 4	149, XIV	
	Pleasant Grove Twp	Typhoid fever	Feb. 12	24, XIV	
	Quincy Twp	Scarlet fever	Oct. 7-8	129, XV	
Rock Dell Twp	Smallpox	Mar. 11	63, XIV		
Rochester C	Typhoid fever	Oct. 12-13	131, XV		
Rochester C	Special	Sept. 28-Oct. 1			
Salem Twp	Smallpox	Feb. 18	34, XIV		
Otter Tail	Aurdal Twp	Typhoid fever	Dec. 22	271, XIV	

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Otter Tail	Aurdal Twp.	Typhoid fever...	Dec. 28-29-30...	279, XIV	
	Fergus Falls C.				
	Deer Creek Twp.				
	Leaf Lake Twp.				
	Otto Twp.				
Pennington	Newton Twp.	Scarlet fever...	Dec. 14-15-16...	178, XV	
	New York Mills V.				
	Eagle Lake Twp.	Tuberculosis	Dec. 20-21	269, XIV	
	New York Mills V.	Diphtheria	Dec. 14-15-16	179, XV	
	Kratka Twp.	Diphtheria	Aug. 26-27	164, XIV	
	Thief River Falls C.	Typhoid fever...	Oct. 22	208, XIV	
	Silverton Twp.				
	Thief River Falls C.				
	Pine	Thief River Falls C.	Miscellaneous	May 5-6-7	100, XIV
		Thief River Falls C.	Smallpox	Feb. 4-5-6	19, XIV
Thief River Falls C.		Tuberculosis	Jan. 24	23, XV	
Thief River Falls C.		Tuberculosis	Mar. 3	57, XV	
Bruno Twp.		Typhoid fever	Jan. 5-6	2, XIV	
Fleming Twp.		Tuberculosis	Jan. 5-6	1, XIV	
Hinckley V.		Tuberculosis	Dec. 31	282, XIV	
Rutledge V.		Smallpox	Jan. 27	28, XV	
Pipestone		Pipestone C.	Miscellaneous	Mar. 7-8	46, XIV
		Troy Twp.	Scarlet fever	Sept. 18-19	119, XV
Polk	Troy Twp.	Scarlet fever	Dec. 16	181, XV	
	Crookston C.	Tuberculosis	Mar. 6	59, XV	
	Crookston C.	Typhoid fever	Mar. 6	60, XV	
	East Grand Forks C.	Smallpox	Nov. 14-15	156, XV	
	Fosston V.	Tuberculosis	Mar. 21	76, XV	
Pope	Lowell Twp.	Miscellaneous	Nov. 12	237, XIV	
	Glenwood C.	Tuberculosis	Dec. 22-23	273, XIV	
Ramsey	Glenwood C.	Tuberculosis	Oct. 5-6	126, XV	
	Gladstone V.	Chickenpox	Nov. 8	152, XV	
Red Lake	New Canada Twp.	Scarlet fever	Jan. 9	4, XIV	
	New Canada Twp.		Feb. 24		
	New Canada Twp.	Special	Feb. 24	88, XV	
	New Canada Twp.	Trichinosis	May 12	91, XV	
	New Canada Twp.	Scarlet fever	June 14	203, XIV	
	North St. Paul V.	Smallpox	Oct. 17	108, XV	
	North St. Paul V.	Scarlet fever	Sept. 7	116, XV	
	North St. Paul V.	Scarlet fever	Sept. 15	113, XIV	
	Rose Twp. Ag. School	Diphtheria	May 28-June 2	254, XIV	
	Rose Twp. Ag. School	Tuberculosis	Dec. 9	25, XIV	
	Rose Twp. Ag. School	Diphtheria	Feb. 13	27, XIV	
	Rose Twp. Ag. School	Diphtheria	Feb. 16	181, XIV	
	Rose Twp. Ag. School	Ivy Poisoning	Sept. 20	40, XV	
	Rose Twp.	Measles	Feb. 9-10	143, XIV	
	St. Paul C.	Pellagra	July 30	139, XIV	
	St. Paul C.	Poliomyelitis	July 24	161, XV	
	St. Paul C.	Typhoid fever	Nov. 15-19-23-24	109, XV	
	White Bear V.	Typhoid fever	Sept. 9		
	Red Lake	White Bear Twp.	Typhoid fever	Oct. 21	207, XIV
		Oklee V.			
Redwood	Garnes Twp.	Typhoid fever	Oct. 28-29	146, XV	
	Red Lake Falls C.				
Renville	Emardville Twp.	Diphtheria	Aug. 7-8	151, XIV	
	Granite Rock Twp.	Smallpox	Jan 20	10, XIV	
	Lamberton V.	Scarlet fever	Jan. 18-19	17, XV	
	Lamberton V.	Smallpox			
	New Avon Twp.	Typhoid fever	Oct. 20-21-22	139, XV	
Rice	Sanborn V.	Scarlet fever	Mar. 8-10	47, XIV	
	Wabasso V.	Typhoid fever	July 30	145, XIV	
	Bird Island V.	Typhoid fever	Aug. 5	146, XIV	
	Bird Island V.	Smallpox	Aug. 5	147, XIV	
	Hawk Creek Twp.	Tuberculosis	Jan. 7	5, XV	
Rice	Hector Twp.	Tuberculosis	Nov. 30-Dec. 1	166, XV	
	Kingman Twp.	Tuberculosis	Feb. 14-15-16	43, XV	
	Palmyra Twp.	Tuberculosis	Nov. 4-5	228, XIV	
	Bridgewater Twp.	Diphtheria	May 22	111, XIV	
	Dundas	Tuberculosis	Feb. 19	48, XV	
Dennison V.					
Rice	Dennison V.	Smallpox	(See 46, XV)		
	Northfield Twp.				
	Faribault C. (School for Feeble Minded)	Typhoid fever	Oct. 9-10-11	197, XIV	
	Faribault C. (School for F. M.)	Susp. Ty. fever	Sept. 29-30	187, XIV	
	Faribault C. (School for F. M.)	Typhoid fever	Nov. 6-7-8	232, XIV	

FIELD INVESTIGATIONS—JANUARY 1, 1914 TO DECEMBER 31, 1915—Continued

County	Township-Village-City	Subject	Date	Index	
Rice	Faribault C. (School for F. M.)	Tuberculosis	Nov. 6-7-8	233, XIV	
	Faribault C. (School for F. M.)	Typhoid fever	April 21-22	95, XIV	
	Faribault C. (School for F. M.)	Typhoid fever	April 9-10	88, XIV	
	Faribault C.	Tuberculosis	Sept. 11	175, XIV	
	Faribault C.	Scarlet fever	Feb. 2-3	32, XV	
	Richland Twp.	Typhoid fever	Sept. 7-8	107, XV	
	Walcott Twp.				
	Webster Twp.	Tuberculosis	Sept. 12	176, XIV	
	Webster Twp.	Tuberculosis	Feb. 2	31, XIV	
	Roseau	Clear River Twp.	Tuberculosis	July 9-10-11-12	127, XIV
Jardis Twp.		Tuberculosis	Oct. 23-24	210, XIV	
St. Louis	Roseau V.				
	Chisholm V.	Tuberculosis	Mar. 2	50, XV	
	Chisholm V.	Trachoma	Mar. 3	51, XV	
	Chisholm V.				
	Evelth V.	Miscellaneous	Mar. 1	52, XV	
	Hibbing V.				
	Virginia C.				
	Duluth C.	Miscellaneous	Aug. 3-4-5-6-7-8-9	153, XIV	
	Duluth C.	Smallpox	April 16-17	90, XIV	
	Hibbing V.	Tuberculosis	Feb. 28	49, XV	
	Meadowlands Twp.	Chickenpox	Jan. 28-29	20, XV	
	Nopeming				
	St. Louis Co. Sanatorium and Almhouse	Tuberculosis	Nov. 26-Dec. 8	253, XIV	
	Scott	Belle Plaine Borough	Typhoid fever	Feb. 9	20, XIV
		Belle Plaine Borough	Typhoid fever	Dec. 28	276, XIV
Belle Plaine Borough		Typhoid fever	Oct. 22	219, XIV	
Hamilton V.		Diphtheria	Dec. 9	172, XV	
Hamilton V.		Smallpox	Dec. 18	182, XV	
New Market Twp.		Tuberculosis	April 15	85, XV	
New Prague C.		Tuberculosis	(See 67, XV)		
Shakopee C.		Scarlet fever	Feb. 10	39, XV	
Spring Lake Twp.		Scarlet fever	Aug. 20	97, XV	
Haven Twp.		Poliomyelitis	(See 106, XV)		
Henderson C.		Miscellaneous	Feb. 12-13	23, XIV	
Albany V.		Poliomyelitis	(See 144, XV)		
Avon Twp.		Tuberculosis	Mar. 17	57, XIV	
Avon Twp.		Tuberculosis	Jan. 27	26, XV	
Belgrade V.		Smallpox	(See 26, XV)		
Sherburne	Brockway Twp.	Typhoid fever	Nov. 23	160, XV	
	Collegeville Twp.				
	Le Sauk Twp.	Scarlet fever	Jan. 18	14, XV	
	St. Joseph V.				
	Eden Lake Twp.	Scarlet fever	Sept. 1	105, XV	
	Eden Lake Twp.	Scarlet fever	Nov. 3	149, XV	
	Eden Valley V.				
	Eden Valley V.	Smallpox	May 14	105, XIV	
	Eden Valley V.	C. Sp. Meningitis	Mar. 26	75, XIV	
	Eden Valley V.	C. Sp. Meningitis	Jan. 19	15, XV	
	Eden Valley V.	Typhoid fever	Nov. 4	150, XV	
	St. Cloud C.				
	Freeport V.	Typhoid fever	Nov. 22	159, XV	
	Krain Twp.	Scarlet fever	Mar. 17	59, XIV	
	Lake George Twp.	Diphtheria	Oct. 19-20	135, XV	
	Spring Hill Twp.				
	Lake George Twp.	Diphtheria	Oct. 14-15	132, XV	
	Spring Hill Twp.				
	Melrose C.	C. Sp. Meningitis	Mar. 1-2	40, XIV	
	Grove Twp.				
	Melrose Twp.	Poliomyelitis	Nov. 22	158, XV	
	St. Martin Twp.				
	Rockville V.				
	Rockville Twp.	Scarlet fever	Jan. 29-30-31	30, XV	
	St. Joseph V.				
	St. Joseph Twp.				
	St. Cloud C.	Tuberculosis	Mar. 16	56, XIV	
	St. Cloud C.	Poliomyelitis	Sept. 3-4-5	106, XV	
	St. Cloud Twp.	Scarlet fever	Dec. 31	187, XV	
	St. Cloud C.	Poliomyelitis	Sept. 23-24	123, XV	
	St. Joseph V.				
	St. Wendell Twp.	Diphtheria	Feb. 24-25-26	35, XIV	
	St. Wendell Twp.	C. Sp. Meningitis			
	St. Wendell Twp.	C. Sp. Meningitis	Mar. 4-5	43, XIV	
	St. Wendell Twp.	Diphtheria	Mar. 1-2-3	41, XIV	
Collegeville Twp.					
Paynesville V.	Smallpox	Oct. 22	136, XV		

FIELD INVESTIGATIONS—JANUARY 1, 1914 TO DECEMBER 31, 1915—Continued

County	Township-Village-City	Subject	Date	Index	
Stearns.....	Paynesville V.	Diphtheria	Oct. 22.....	137, XV	
	Paynesville Twp.	Diphtheria	Dec. 29.....	185, XV	
Steele.....	Paynesville V.	Typhoid fever.	Dec. 29.....	186, XV	
	Aurora Twp.	Scarlet fever.	May 15-16.....	106, XIV	
	Havana Twp.				
	Aurora Twp.	Scarlet fever.	(See 80, XV)		
	Havana Twp.				
	Medford Twp.	Typhoid fever.	(See 107, XV)		
Swift.....	Appleton V.	Smallpox	Aug. 13.....	159, XIV	
	Appleton V.	Smallpox	Nov. 2.....	226, XIV	
	Benson C.	Typhoid fever.	Nov. 19-20.....	243, XIV	
	Benson C.	Tuberculosis	Oct. 29.....	224, XIV	
	Benson C.	Typhoid fever.	Sept. 21-24.....	182, XIV	
	Benson C.	Typhoid fever.	Aug. 23-27.....	165, XIV	
	Benson C.	Typhoid fever.	Aug. 10-12.....	154, XIV	
	Benson C.	Typhoid fever.	Sept. 6-7.....	171, XIV	
	Benson C.	Miscellaneous.	July 26.....	94, XV	
	Benson C.	Scarlet fever.	Sept. 20.....	120, XV	
	Benson C.	Diphtheria	Nov. 4-5-6.....	151, XV	
	Benson C.	Scarlet fever.	Dec. 21-22-23.....	184, XV	
	Benson C.	Typhoid fever.	Dec. 20.....	183, XV	
	Clontarf Twp.				
	Clontarf V.	Diphtheria	Aug. 11.....	158, XIV	
	De Graff V.	Diphtheria	Sept. 20.....	121, XV	
	Swenoda Twp.	Tuberculosis	Nov. 21.....	244, XIV	
	Todd.....	Browerville V.			
		Bruce Twp.	Scarlet fever.	Jan. 31-Feb. 1-2..	34, XV
		Hartford Twp.			
Little Elk Twp.					
Burleone Twp.		Tuberculosis	Oct. 10.....	198, XIV	
Grey Eagle V.		Tuberculosis	Mar. 22-23.....	77, XV	
Staples C.		Tuberculosis	Sept. 17-18.....	180, XIV	
Traverse.....	Wykeham Twp.	Tuberculosis	Oct. 9.....	196, XIV	
	Dumont V.	Tuberculosis	Oct. 25.....	141, XV	
Wabasha.....	Wheaton V.	Miscellaneous.	Feb. 26-Mar. 1.....	38, XIV	
	Elgin V.	Sore throat	Nov. 24.....	248, XIV	
Wabasha.....	Minneiska V.	Typhoid fever.	May 18.....	108, XIV	
	Minneiska V.	Tuberculosis	May 18.....	109, XIV	
	Minneiska V.	Typhoid fever.	Sept. 22-23.....	122, XV	
	Plainview V.	Scarlet fever.	(See 129, XV)		
	Watopa Twp.	Diphtheria	Nov. 10-11.....	236, XIV	
	Wabasha C.	Scarlet fever.	Mar. 3-4.....	42, XIV	
	Zumbro Falls V.	Itch	Feb. 3-4.....	33, XV	
Wadena.....	Huntersville Twp.	Smallpox	Jan. 12-13.....	8, XIV	
	Sebeka V.	Tuberculosis	Jan. 15-16.....	11, XV	
Waseca.....	Waseca C.	Tuberculosis	Jan. 28.....	27, XV	
	Waseca C.	Tuberculosis	Mar. 6.....	62, XV	
	Waseca C.	Tuberculosis	Mar. 13.....	69, XV	
	Waseca C.	Tuberculosis	Mar. 23-24.....	78, XV	
Washington.....	Cottage Grove Twp.	Diphtheria	Mar. 25.....	79, XV	
	Grant Twp.	Diphtheria	July 29.....	142, XIV	
	Grant Twp.	Diphtheria	Feb. 19.....	41, XV	
	Newport V.	Typhoid fever.	Dec. 16.....	262, XIV	
	Newport V.	Typhoid fever.	Dec. 19.....	266, XIV	
	Newport Twp.	Tuberculosis	Mar. 30.....	84, XV	
	Newport Twp.	Typhoid fever.	Aug. 12.....	156, XIV	
	Oneka Twp.	Tuberculosis	Dec. 28.....	274, XIV	
	Stillwater C.	Chickenpox.	May 11.....	103, XIV	
	Stillwater C.	Typhoid fever.	Sept. 2-3.....	169, XIV	
	Stillwater C.	Scarlet fever.	Sept. 12.....	174, XIV	
Watonwan.....	St. Paul Park V.	Typhoid fever.	June 23.....	93, XV	
	Madelia V.	Smallpox	Dec. 14.....	176, XV	
	Madelia V.	Tuberculosis	Dec. 14.....	177, XV	
	Madelia Twp.				
Wilkin.....	St. James C.	Typhoid fever.	Sept. 9-10.....	173, XIV	
	Breckenridge C.	Scarlet fever.	Dec. 10-11.....	255, XIV	
Winona.....	Winona C.	Scarlet fever.	Jan. 28.....	14, XIV	
	Winona C.	Tuberculosis	Jan. 16.....	16, XV	
	Winona C.	Typhoid fever.	Jan. 21.....	19, XV	
Wright.....	Annandale V.	Chickenpox.	Jan. 7.....	3, XIV	
	Annandale V.	Scarlet fever.	Mar. 23.....	69, XIV	
	Corinna Twp.				
	Clearwater Twp.	Poliomyelitis.	Sept. 1-2.....	104, XV	
	Clearwater Twp.	Poliomyelitis.	(See 123, XV)		
Corinna Twp.	Tuberculosis	Sept. 27-28.....	125, XV		
	French Lake Twp.	Diphtheria	Sept. 7-8.....	172, XIV	

FIELD INVESTIGATIONS—JANUARY 1, 1914 TO DECEMBER 31, 1915—Continued

County	Township-Village-City	Subject	Date	Index
Wright	French Lake Twp.	Diphtheria	Feb. 16-17.	44, XV
	Howard Lake V.	Typhoid fever.	Aug. 14.	157, XIV
	Middleville Twp.	Scarlet fever.	Feb. 16-17.	30, XIV
	Middleville Twp.	Scarlet fever.	Mar. 15-16-17.	70, XV
	Victor Twp.	Tuberculosis.	Mar. 15-16-17.	71, XV
	Middleville Twp.			
	Woodland Twp.			
Yellow Medicine ..	Waverly V.	Poliomyelitis.	Sept. 15.	179, XIV
	Clarkfield V.	Tuberculosis.	Sept. 4-5.	49, XIV
	Normania Twp.	Typhoid fever.	Mar. 11.	170, XIV
	Granite Falls C.			
	Granite Falls C.			
Normania Twp.	Typhoid fever.	Nov. 12-13.	154, XV	
		Typhoid fever.	(See 98, XIV)	

LIST OF INVESTIGATIONS—TUBERCULOSIS 1914

Sixty-six epidemiological investigations of tuberculosis were made in 83 different sanitary districts of 35 counties. The field work required 109 days.

County	Sanitary District	County	Sanitary District
Anoka	Anoka city	Hennepin	Excelsior village
Becker	Cuba township		Minneapolis C. Thomas Hosp.
	Cuba township		Minneapolis C. Soldiers' H.
	Lake Park village	Kanabec	Whitted township
Beltrami	Bemidji city		Whitted township
	Bemidji city		Whitted township
	Eckles township	Lake	Knife River village
Blue Earth	Amboy village		Two Harbors township
	Beauford township	Lyon	Lake Marshall township
	Butternut Valley township	Marshall	East Park township
	Cambria township		Holt township
	Danville township	Meeker	Forest City township
	Decoria township		Kingston township
	Garden City township		Manannah township
	Garden City village		Manannah township
	Good Thunder village	Mower	Austin city
	Jamestown township		Pleasant Valley township
	Judson township	Otter Tail	Eagle Lake township
	Lake Crystal village	Pine	Fleming township
	LeRoy township		Hinckley village
	Line township	Pope	Glenwood village
	Lincoln township	Ramsey	Rose township
	Lyra township	Renville	Palmyra township
	McPherson township	Rice	Faribault city
	Mapleton township		Faribault city
	Mankato city		Lonsdale village
	Medo township		Webster township
	Rapidan township	Roseau	Clear River township
	Shelby township		Jadis township and Roseau village
	South Bend township	St. Louis	St. Louis county Sanatorium and Alm House, Nopening
	Sterling township	Stearns	Avon township
	Vernon Center township		St. Cloud city
Carver	Hancock township	Swift	Benson city
Cass	Unorganized township L 134 N. R. 29 W.		Swenoda township
Chippewa	Sparta township	Todd	Burleene township
Clay	Moorhead city		Staples city
Clearwater	Greenwood township		Wykeham township
Douglas	Lund township	Wabasha	Minneiska village
	Lund township	Winona	Saratoga township
Fræborn	Hartland village	Washington	Oneka township
Goodhue	Red Wing city	Yellow Medicine	Clarkfield village and Normania township
Grant	Roseville township		

LIST OF INVESTIGATIONS—TUBERCULOSIS, 1915

Forty-six epidemiological investigations of tuberculosis were made in 57 different sanitary districts of 30 counties. The field work required 68 days.

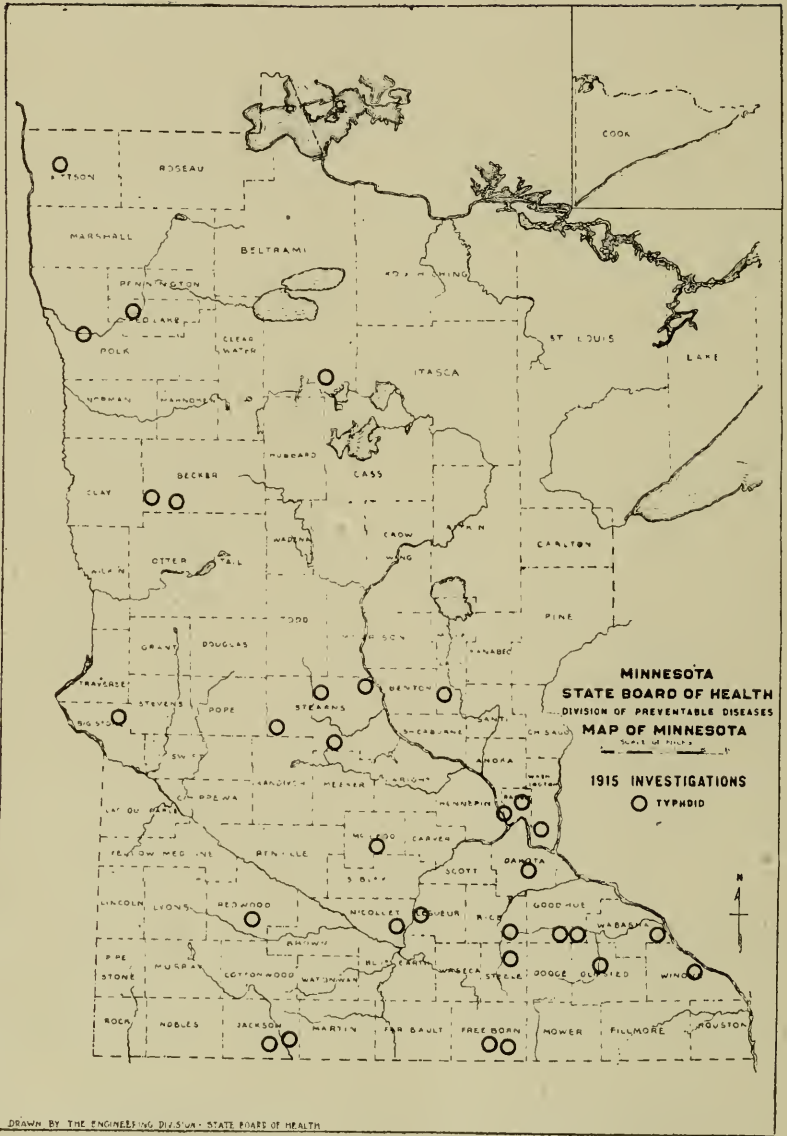
County	Sanitary District	County	Sanitary District
Beltrami	Bemidji city	Mille Lacs	Waukon village
	Myhre township	Nobles	Brewster village
	Northwood township	Pennington	Thief River Falls city
	Spruce Valley township		Thief River Falls city
Benton	Foley village	Polk	Crookston city
Blue Earth	Garden City village		Fosston village
	Lincoln township	Renville	Hawk Creek township
Cottonwood	Highwater township		Hector township
Crow Wing	Deerwood township	Rice	Dennison village
	Riverton village		Webster township
Goodhue	Vasa township	Scott	New Market township
	White Rock village		New Prague city
Hennepin	"U. of M." Hospital, Minne- apolis	Stearns	Avon township
Le Sueur County Tuberculosis Survey:			St. Cloud city
	Cordova township	St. Louis	Chisholm village
	Elysian township		Hibbing village
	Kasota village	Todd	Grey Eagle village
	Kasota township	Traverse	Dumont village
	Le Sueur city	Wadena	Sebeka village
	Le Sueur Center village		Meadows township
	Montgomery city	Waseca	Waseca city
	New Prague city		Waseca city
	Sharon township		Waseca city
	Tyrone township	Washington	Newport township
	Waterville city		St. Paul Park village
Le Sueur	Le Sueur city	Watsonwan	Madelia village
	New Prague city		Madelia township
Marshall	Valley township	Winona	Winona city
Martin	Elm Creek township	Wright	Corrina township
McLeod	Hassan Valley township		Middleville township
Meeker	Manannah township		Woodland township

LIST OF INVESTIGATIONS—TYPHOID FEVER—DYSENTERY, 1914

Seventy epidemiological investigations of typhoid fever and dysentery were made in 61 different sanitary districts of 37 counties. The field work required 109 days.

County	Sanitary District	County	Sanitary District
Aitkin	Hill City village	Olmsted	Oronoco and New Haven townships
Anoka	Anoka city and Ramsey township		Oronoco township
	Anoka township		Pleasant Grove township
Becker	Spring Creek township	Otter Tail	Aurdal township
Big Stone	Moonshine township		Aurdal township and Fergus Falls city
Brown	Cottonwood township	Pennington	Holt township, Marshall Co., Silverton township and Thief River Falls City, Pennington county
	New Ulm city		
	New Ulm city	Pine	Bruno township
Carlton	Cloquet city	Redwood	Wabaso village
Carver	Benton and Hancock townships	Red Lake	Oklee village and Garness township
Chippewa	Woods township	Renville	Bird Island village
Clay	Flowing and Goose Prairie townships	Rice	Faribault city, School for Feeble Minded
Cottonwood	Highwater township		Faribault city
Crow Wing	Brainerd city		Faribault city
	Crosby village		Faribault city
Dakota	Rich Valley village		Faribault city
	Rich Valley village	Scott	Belle Plaine Borough
	West St. Paul city		Belle Plaine Borough
Fillmore	Newburg township	Swift	Benson city
Freeborn	Albert Lea city		Benson city
Hennepin	Champlin township		Benson city
	Crystal Lake township		Benson city
	Minneapolis city, Elliott Hospital	Wabasha	Minneiska village
	Minneapolis city, U. of M.	Washington	Newport township
	Minneapolis city		Newport village
	Plymouth township		Newport village
	Robbinsdale village		Stillwater city
	West Minneapolis village	Watsonwan	St. James city.
Kittson	Poppleton township	Wright	Howard Lake village
Lake	Two Harbors city	Yellow Medicine	Granite Falls city
Le Sueur	Le Sueur city		Normania township and Cottonwood village
Lincoln	Hendricks village		
Lyon	Custer township		
	Cottonwood village and Normania township, Yellow Medicine county		
	Marshall city		
Marshall	Holt township		
Mille Lacs	Greenbush township	Anoka	Anoka city, State Asylum
Nicollet	Courtland and Lafayette townships	Dakota	Anoka city, State Asylum
			South St. Paul city
			South St. Paul city

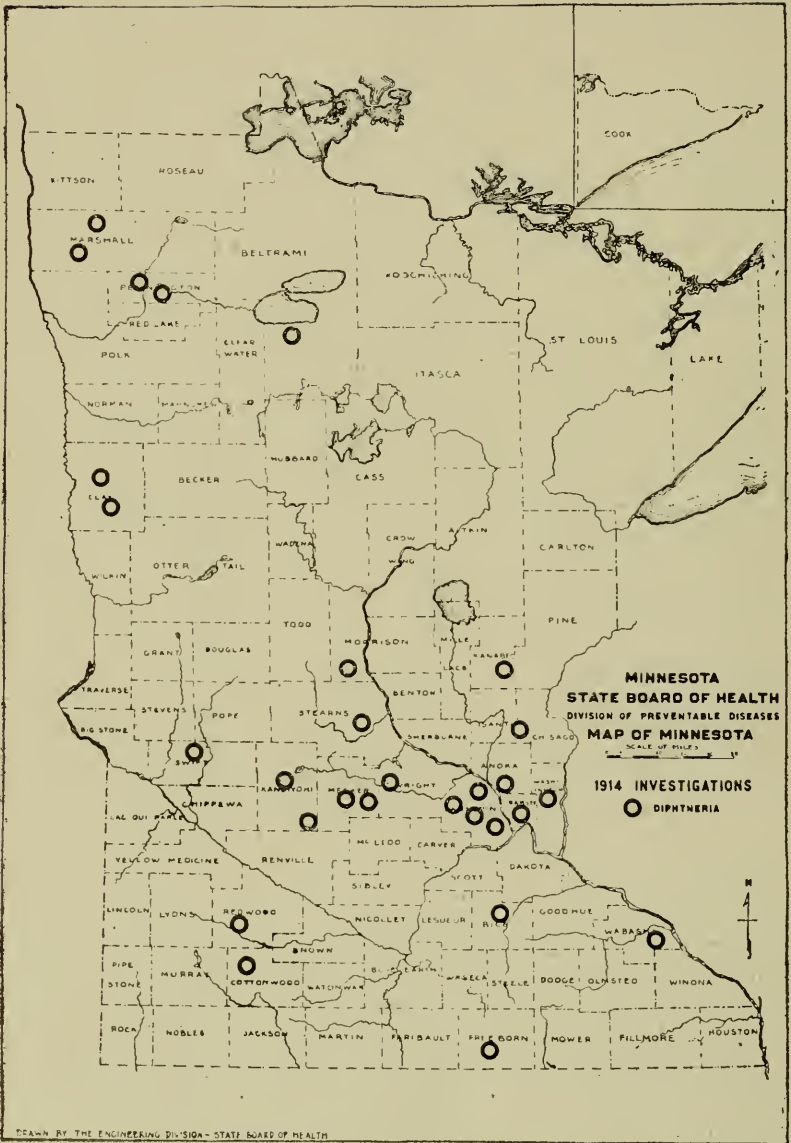
Dysentery



LIST OF INVESTIGATIONS—TYPHOID FEVER, 1915

Twenty-nine epidemiological investigations of typhoid fever were made in 43 different sanitary districts of 25 counties. The field work required 44 days.

County	Sanitary District	County	Sanitary District
Becker	Detroit city	Mille Lacs	Milo township
	Lake Park township	Nicollet	St. Peter city
Beltrami	Bemidji city	Olmsted	Rochester city
Big Stone	Malta township	Polk	Crookston city
Dakota	Hampton village	Ramsey	St. Paul city
Freeborn	Albert Lea city		White Bear village
	Albert Lea city		White Bear township
	Albert Lea township	Red Lake	Emondville township
Goodhue	Mineola township		Red Lake Falls city
	Pine Island township	Redwood	New Avon township
	Roscoe township	Rice	Richland township
	Mineola township		Walcott township
	Pine Island township	Stearns	Brockway township
Hennepin	Minneapolis city		Eden Valley village
	Richfield village		St. Cloud city
Jackson	Alpha village		Freeport village
	Alpha village		Paynesville village
	Jackson village	Steele	Medford township
Kittson	Hallock village	Swift	Benson city
Le Sueur	Cleveland township		Torning township
	Washington township	Wabasha	Minneiska village
McLeod	Glencoe village	Washington	St. Paul Park village
	Helen township	Winona	Winona city
	Hassan Valley township		

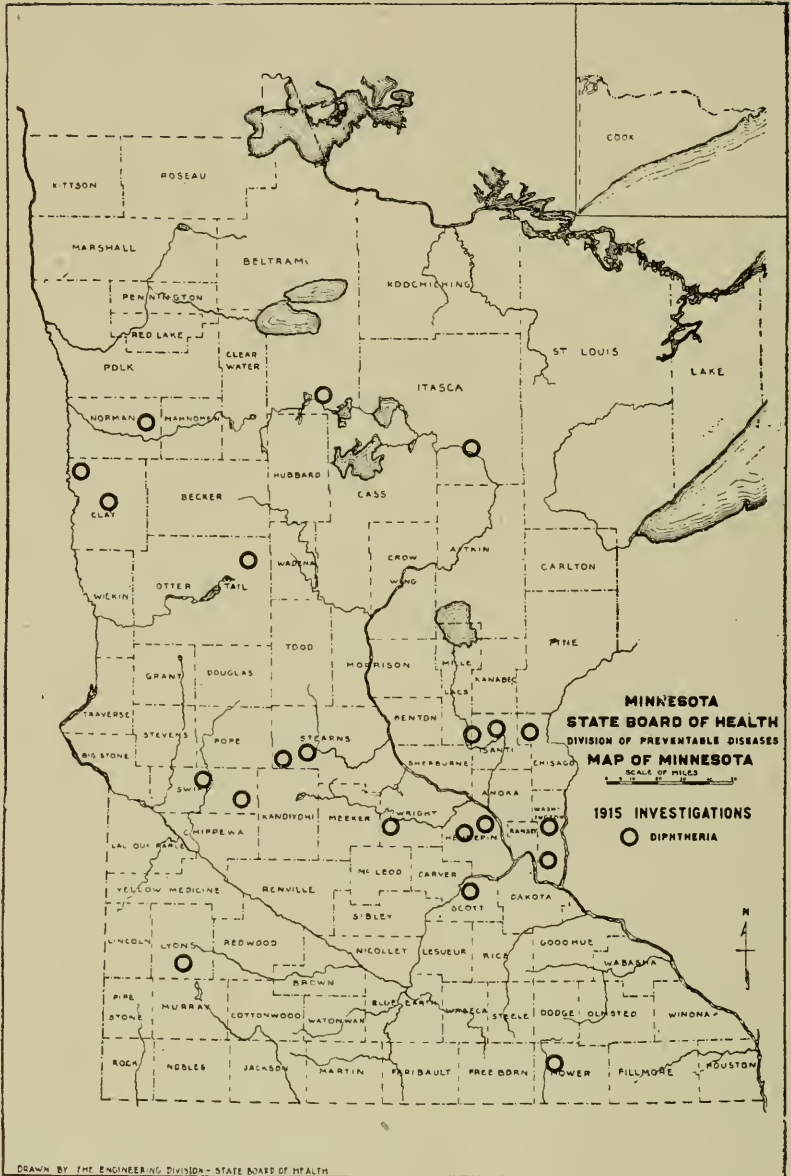


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LIST OF INVESTIGATIONS—DIPHTHERIA—1914

Thirty-five epidemiological investigations of diphtheria were made in 38 different sanitary districts of 21 counties. The field work required 60 days.

County	Sanitary District	County	Sanitary District
Anoka	Columbia Heights village Fridley township Fridley township	Meeker	Darwin township Litchfield village
Beltrami	Alaska and Maple Ridge townships	Morrison	Two Rivers township
Chisago	Fish Lake township	Pennington	Kratka township and Thief River Falls city
Clay	Glyndon village and Elkton and Elmwood townships	Ramsey	Rose township, School of Agriculture Rose township Rose township
Cottonwood	Storden township	Redwood	Granite Rock township
Freeborn	Albert Lea city	Rice	Bridgewater township
Hennepin	Brooklyn Center village Brooklyn Center village Crystal Lake township Golden Valley township Golden Valley township Minneapolis city	Stearns	St. Wendell township. See Stearns Co., St. Wendell township, Miscellaneous: Cerebrospinal Meningitis St. Wendell township
Kanabec	Comfort township	Swift	Clontarf township
Kandiyohi	East Lake Lillian township Willmar city Willmar city	Wabasha	Watopa township
Marshall	Alma and Middle River townships Nelson Park, Wagner and Wright townships	Washington	Grant township. See Washington Co. Scarlet fever: 142, XIV
		Wright	French Lake township



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LIST OF INVESTIGATIONS—DIPHtherIA—1915

Twenty-five epidemiological investigations of diphtheria were made in 25 different sanitary districts of 16 counties. The field work required 42 days.

County	Sanitary District	County	Sanitary District
Beltrami.....	Bemidji city	Norman.....	Gary village
Chisago.....	Fish Lake township	Ottertail.....	New York Mills village
Clay.....	Georgetown township	Scott.....	Hamilton village
	Viding township	Stearns.....	Lake George township
	Spring Prairie township		Spring Hill township
Hennepin.....	Osseo village		Lake George township
	Plymouth township		Spring Hill township
	Plymouth township		Paynesville township
Isanti.....	Wyanette township		Paynesville village
	Wyanette township		Paynesville township
Itasca.....	Cohasset village	Swift.....	Benson city
	Grand Rapids village		DeGraff village
Lyon.....	Custer township	Washington...	Cottage Grove township
Mille Laes....	Princeton township		Grant township
Mower.....	Austin city	Wright.....	French Lake township
	Austin city		

LIST OF INVESTIGATIONS—SCARLET FEVER, MEASLES AND GERMAN MEASLES
1914

Forty-eight epidemiological investigations of scarlet fever, measles and German measles were made in 50 different sanitary districts of 28 counties. The field work required 77 days.

County	Sanitary District	County	Sanitary District
Aitkin.....	Hill City village	Lincoln.....	Hoop, Marshfield and Shook- atan townships and Tyler village
Anoka.....	Columbia Heights village	Lyon.....	Sherburne township
	Columbia Heights village	Mower.....	Austin city
	Fridley township		Grand Meadow village
Beltrami.....	Funkley village		Grand Meadow village
Carver.....	Watertown village	Murray.....	Fulda village
Cottonwood....	Delton township	Nobles.....	Bloom and Seward townships
Dakota.....	Egan township	Olmsted.....	Byron village and Kalmar township
	Invergrove township		Dover township
	Mendota township.		Dover township
	(See Egan township)		Dover township
	Mendota township	Ramsey.....	New Canada township
	Mendota township	Redwood.....	Sanborn village
	Mendota township	Stearns.....	Krain township
	South St. Paul city	Steele.....	Aurora and Havana township
Fillmore.....	Mabel village	Wabasha.....	Wabasha city
	Mabel village	Winona.....	Winona city
Hennepin.....	Eden Prairie township	Waseca.....	Vivian township
	Independence township	Washington...	Grant township
	Independence and Minne- trista townships		Stillwater city
	Minneapolis city, Elliott Hospital	Wilkin.....	Breckenridge city
	(See Hennepin Co., Miscel- laneous, Whooping cough)	Wright.....	Annandale village and Cor- inna township
	West Minneapolis village		Middleville township
	West Minneapolis village		Measles
Itasca.....	Deer River village and Otena- gon township	Carver.....	Watertown village
Isanti.....	Stanford township		German Measles
Kanabec.....	Arthur township	Olmsted.....	Byron village and Kalmar township
	Mora village		
	Mora village		
Lake.....	Two Harbors city		

LIST OF INVESTIGATIONS—SCARLET FEVER AND MEASLES—1915

Forty epidemiological investigations of scarlet fever and measles were made in 59 different sanitary districts of 27 counties. The field work required 63 days.

County	Sanitary District	County	Sanitary District
Aitkin	Hazelton township	Redwood	Lamberton village
Carlton	Twin Lakes township	Rice	Faribault city
Clay	Barnesville city	Scott	Shakopee city
Cottonwood	Jeffers village		Spring Lake township
Crow Wing	Jenkins village	Stearns	Collegeville township
	Seminole township		Le Sauk township
Dodge	Ripley township		St. Joseph village
Freeborn	Albert Lea city		Eden Lake township
	Baneroff township		Eden Valley township
Hennepin	Brooklyn Center village		Eden Lake township
	Eden Prairie township		Rockville village
	Edina village		Rockville township
	Minnetonka township		St. Joseph village
	Orono township		St. Joseph township
Koochiching	Big Falls village		St. Cloud township
	Grand Falls township	Steele	Aurora township
Lake	Two Harbors city		Havana township
Lyon	Minneota village	Swift	Benson city
Meeker	Forest City township		Benson city
Nicollet	North Mankato village	Todd	Browerville village
	Oshwa township		Bruce township
Olmsted	Quincy township		Hartford township
Ottertail	Deer Creek township		Little Elk township
	Leaf Lake township	Wabasha	Plainview village
	New York Mills village	Wright	Delano village
	Newton township		Middleville township
	Otto township		Victor township
Pipestone	Troy township	Yellow Medicine	Granite Falls city
	Troy township		
Ramsey	New Canada township		Measles
	North St. Paul village	Ramsey	Rose township
	North St. Paul village		

LIST OF INVESTIGATIONS—CHICKENPOX AND SMALLPOX—1914

Thirty-four epidemiological investigations of smallpox and chickenpox were made in 39 different sanitary districts of 25 counties. The field work required 43 days.

County	Sanitary District	County	Sanitary District
Aitkin.....	Salo township	Olmsted.....	Byron village and Kalmar township
Anoka.....	Columbia Heights village		Cascade and Kalmar townships
Carlton.....	Blackhoof township		Rock Dell township
	Cloquet city		Salem township
	Wrenshall township	Pennington....	Thief River Falls city
Chippewa....	Appleton village	Ramsey.....	North St. Paul Village.
Cottonwood...	Storden township	Redwood.....	Lamberton village
Hennepin.....	Minneapolis city, Elliott Hospital	Renville.....	Bird Island village
	Minneapolis city, U. of M.	Stearns.....	Eden Valley village and Mannah township
	Minneapolis city, U. of M.	St. Louis.....	Duluth city
Kandiyohi....	Pennoek village and Mamre township	Swift.....	Appleton village
Kittson.....	Bronson village and Jupiter and Hazelton townships	Wadena.....	Huntersville township
Le Sueur.....	Waterville city	Washington...	Stillwater city
Marshall.....	New Solum township	Wright.....	Annandale village
Murray.....	Fulda village and Belfast township		Howard Lake village
Nobles.....	Seward township		Chickenpox
Norman.....	Fossum township	Beltrami.....	Funkley village
		Hennepin.....	St. Louis Park village
		Olmsted.....	Kalmar township

LIST OF INVESTIGATIONS—SMALLPOX AND CHICKENPOX—1915

Twenty-three epidemiological investigations of smallpox and chickenpox were made in 26 different sanitary districts of 19 counties. The field work required 27 days.

County	Sanitary District	County	Sanitary District
Benton.....	Sauk Rapids township	Nobles.....	Wilmon village
Blue Earth....	Mankato city	Norman.....	Hendrum township
Cass.....	Pine River village	Pine.....	Rutledge village
Faribault.....	Elmore village	Polk.....	East Grand Forks city
	Elmore township	Rice.....	Dennison village
Goodhue.....	Warsaw township		Northfield township
Hennepin.....	Long Lake village	Scott.....	Hamilton village
	Orono township	Stearns.....	Belgrade village
	Mound village		Paynesville village
	Orono township	Watowan....	Madelia village.
	Orono township		Chickenpox
	Orono township	Dakota.....	South St. Paul city
Le Sueur.....	Waterville city	Ramsey.....	Gladstone village
	Waterville township		New Canada township
Meeker.....	Eden Valley village	St. Louis.....	Meadowlands township

LIST OF INVESTIGATIONS—MISCELLANEOUS—1914-1915

Fifty-three epidemiological investigations, or trips for miscellaneous purposes were made in 56 different sanitary districts of 31 counties. The field work required 92 days.

County	Sanitary District	County	Sanitary District
School Supervision and Talks on Public Health			
Itasca	Deer River village	Clay	Goose Prairie township (Whooping cough)
Nicollet	St. Peter city	Hennepin	Edina township (Catarrhal jaundice)
Pennington	Thief River Falls city		Minneapolis city
Pipestone	Pipestone city		Minneapolis city
Sibley	Henderson city	Itasca	Bovey village
Traverse	Wheaton village		Coleraine village
Trachoma			
Becker	Spring Creek township		Grand Rapids village
Beltrami	Bemidji city		Holman village
	Cormant township		Marble village
Morrison	Royalton village		Taconite village
St. Louis	Chisholm village	Kandiyohi	Willmar city
Pellagra			
Hennepin	Minneapolis city	Kittson	Hampden township
Nicollet	St. Peter city	Koochiching	International Falls city
Ramsey	St. Paul city	Le Sueur	Cleveland township (Epidemic sore throat and influenza)
Leprosy			
Goodhue	Stanton township	Polk	Lowell township
Hennepin	Independence township	Ramsey	New Canaan township
	Minneapolis city		New Canaan township
Kittson	St. Vincent village		Rose township
Mille Lacs	Milaca township	St. Louis	Biwabik village
Miscellaneous			
Aitkin	Verdon township (Syphilis)		Chisholm village
Carlton	Cloquet city		Duluth city
Cass	State Sanatorium		Ely city
			Eveleth city
			Gilbert village
			Hibbing village
			Chisholm village
			Eveleth city
			Hibbing village
			Virginia city
		Swift	Benson city
		Wabasha	Elgin village
			Zumbro Falls village

SPECIAL TRIPS

No Summaries

County	Township-Village-City	Date	Dr.
Cass	State Sanatorium	July 13, 1915	(C)
	State Sanatorium	Oct. 28-29, 1914	(C)
Dakota	Hampton V.	Mar. 12, 1915	(C)
Freeborn	Albert Lea C.	Dec. 15-16, 1915	(C)
Hennepin	West Minneapolis V.	Feb. 4, 1915	(L)
Kandiyohi	Willmar C.	Dec. 28-29, 1914	(C)
Lac qui Parle	Dawson V.—Madison C.	Oct. 21-22-23, 1914	(C)
Norman	Ada C.	Nov. 9, 1914	(C)
Olmsted	Rochester C.	Sept. 28-29-30-Oct. 1, 1915	(C)
Pennington	Thief River Falls C.	Nov. 17-18-19, 1914	(G)
Sibley	Winthrop V.	Dec. 2, 1914	(B)
St. Louis	Co. Hosp. and Nopeming San.	Oct. 8-9, 1914	(C)
Winona	Winona C.	Aug. 21, 1914	(C)

(B)—Dr. H. A. Burns.

(C)—Dr. A. J. Chesley.

(G)—Dr. W. P. Greene.

(L)—Dr. H. G. Lampson.

STATE BOARD OF HEALTH

DIVISION OF SANITATION

BIENNIEL REPORT

January 1, 1914 to January 1, 1916

H. A. WHITTAKER, Director

MINNESOTA STATE BOARD OF HEALTH

Division of Sanitation

Biennial Report

January 1, 1914, to January 1, 1916

H. A. Whittaker, Director

INTRODUCTION.

This Division, as stated in the introduction of this report, was created by the action of the Board at its meeting April 14, 1914, and went into effect May 1, 1914.

Duties—The duties of this Division are defined by the regulations of the Board, as follows:

(a) To make field, engineering and laboratory investigations within the state, and to report the findings to the executive officer of the State Board of Health. Recommendations based upon these investigations are to be made to the executive officer either directly or after consultation with other divisions concerned.

(b) To make special investigations of problems whose solution may prove of value in conserving public health, or in the advancement of science.

Work—The work of the Division can be classified as: (a) Routine, (b) Special, (c) Research, and (d) Educational.

(a) The routine work consists of office, engineering and laboratory investigations on water supplies, milk supplies, sewerage systems, garbage disposal, and the sanitary arrangements of certain public buildings. The scope, methods and results of all investigations on these subjects will be found under the individual headings in the body of this report.

(b) From time to time topics that require special study in order to obtain satisfactory results are presented. Investigations are made and special reports are prepared in such a manner as to comply with the regular routine system of records.

Several problems of this character have been started during the present biennial period or continued from the previous period. The following are a few examples of such work: The investigation of railroad water supplies in order to determine the sanitary quality of water used for drinking purposes on trains in Minnesota; the investigation of the water supply and sewage disposal of new public school buildings in order to comply with the state law relating to this subject; and the testing of sewage treatment plants throughout the state, in order to determine their efficiency.

(c) Research work is undertaken on subjects directly related to the activities of the Division. During the present biennial period, investigations have been undertaken and technical papers prepared on various subjects. An improved portable emergency hypochlorite plant and laboratory equipment for field use have been designed and constructed.(1) This emergency hypochlorite treatment was applied during epidemics of typhoid fever(2) and dysentery.(3)

(1) Hypochlorite Treatment of Water Supplies, Public Health Reports, Vol 30, No. 9, 1915.

(2) Typhoid Epidemic at Benson, page 259.

(3) A Water-Borne Dysentery Epidemic at South St. Paul, Public Health Reports, Vol. 30, No. 48, 1915.

Comparisons have been made of various laboratory methods now in use for testing sewage and trade waste treatment plants. These studies have resulted in the establishment of a routine procedure to be used in testing such plants throughout the state. The disposal of creamery waste has also been under investigation. The general design of sewage and trade waste treatment plants has been undertaken for special cases, particularly in relation to public school buildings.

(d) Educational work is becoming an important activity. Lectures are given on various subjects at educational institutions and before civic and technical organizations. A course of lectures has been given in connection with public health teaching at the University of Minnesota. Technical and popular articles have been prepared for journals and newspapers in order to give information to citizens of the activities of the Division in their respective communities. The local newspapers are furnished with summaries of investigation in their districts.

Bulletins on subjects of statewide interest have been prepared and distributed free of charge. (1),(2),(3).

Staff—In order to carry on the work of this Division, it is necessary to maintain a staff of technical workers who are especially trained in the branches of sanitary science involved. These persons must be thoroughly competent as their investigations form a basis for the opinions offered by the Division. A correct opinion is most important in this work, as it may have a bearing on the health of an entire community. In addition to this technical staff, a clerical force and non-technical assistants are necessary.

The present staff of the Division consists of the following personnel:

- H. A. Whittaker, B. A., director.
- J. A. Childs, C.E., engineer.
- B. M. Mohler, B.S., chemist.
- Frank Raab, assistant chemist.
- Florence H. Spear, clerk and stenographer.
- Gertrude Kimball, stenographer.

During the past year the Division has lost the services of two valuable men, Dr. R. H. Mullin, its former director, and Mr. F. H. Bass, former director of the Engineering Division.

Location and Equipment—The Division is housed in seven rooms located in the Institute of Public Health and Pathology on the University Campus, Minneapolis. Two rooms are equipped exclusively for office purposes, one for engineering work, and four for laboratory work. The laboratories are equipped with the necessary apparatus for such analytical work as may be required in conducting investigations. The Division maintains extensive equipment for carrying on engineering and laboratory work in the field. This is very necessary in a large state such as Minnesota, where many investigations must be undertaken at long distances from headquarters.

Appropriations—The appropriations made for carrying on the work of this Division were formulated on the basis which existed in 1913. It became necessary, therefore, for the Board to divide the appropriation for laboratory work, assigning a part to the Division of Preventable Diseases and a part to this Division. The total amount of the funds for carrying on the work of this Division is \$14,000 per annum.

"Follow-up" System on Investigations—A system has been inaugurated which follows up every investigation that contains recommendations for the improvement of conditions or the protection of public health. This system was installed with two purposes in view; one to obtain a definite record as to whether or not local authorities were complying with the recommendations of the Division, and the other to constantly keep the recommendations before the local authorities so that there would be no excuse for delinquency

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- (1) Bulletin entitled "Farm Water Supplies."
 - (2) Bulletin entitled "The Sanitary Privy."
 - (3) Bulletin entitled "Sewage Disposal in Unsewered Districts."

on their part. The routine procedure of the system is as follows: After sufficient time has elapsed to allow for necessary action, a letter is sent to the parties involved, inquiring if any steps have been taken to comply with the recommendations of the report in question. In case no reply is received, a second inquiry letter is sent which urges that the recommendations be given immediate consideration. If no reply is received to either communication, the case is referred to the executive officer for action. This work was systematically begun on August 1, 1914, hence there has not been sufficient time to determine its ultimate value. It often requires much time to secure the necessary local funds to initiate new municipal projects or to improve existing conditions. However, the results which appear later in this report show that much progress has been made in improving conditions relating to environmental sanitation throughout the state.

Service Rendered to the State—It is impossible to make a complete statement on this subject without discussing in detail each branch of the work, yet a few facts will be of interest.

The Division is in a position to give advice with the view of improving or correcting sanitary conditions for the protection of public health or the following subjects; water supplies, milk supplies, sewerage systems, garbage disposal and the sanitary arrangements of certain public buildings. Opinions on these subjects are not offered until the particular problem has been carefully investigated. This advice has a bearing on the health of the people in the communities where investigations are made.

The records of the Division on these problems, which include detailed reports, plans and analytical results, are exceedingly valuable, as they constitute permanent records of conditions relating to environmental sanitation throughout the state. On account of the lack of funds, the work of the Division has been limited to the most urgent problems affecting the public health and investigations along certain lines have been very seriously hampered.

WATER SUPPLIES.

The value of a safe water supply so far as relates to its sanitary quality, is a fact which should be common knowledge to every person in the state. Nevertheless, there still exists on the part of many communities a lack of appreciation of the dangers of improperly protected water supplies. This fact has been very emphatically brought out during the present biennial period by one dysentery and two typhoid fever epidemics which were due to defective municipal or company water supplies. In one case, the municipality had been warned by this Board that the water supply was unsafe for public consumption, yet it continued to use the water until the epidemic occurred.

Scope of Work and Conditions Governing Investigations—The following circular has been prepared, which states the position taken by this Board in regard to water supply investigations:

"On account of the lack of funds, it is necessary for the State Board of Health to limit its routine work to certain classes of water supplies.

"Investigations are made on all public water supplies, so far as appropriations will permit, excepting as hereafter provided. These investigations include proposed and existing public supplies of all types and water purification plants.

"The State law provides that the water supplies of public school buildings shall be approved by the State Board of Health. This law was passed without providing the State Board of Health with funds for such work; therefore, it has been necessary to require local school boards to pay a portion of the expense involved, i. e., the field expense incurred in making such investigations. This has been approved by the Department of Education. It is recognized that this work should be done free of charge to the local school authorities, but this is impossible with the present funds.

"Private water supplies cannot be investigated entirely free of charge as a routine procedure. The importance of giving every citizen in the state exact information concerning the particular water supply used by the family is not denied, but again the lack of funds makes this impossible. Therefore, it has been necessary to differentiate between water supplies used by a few or by many persons, and to restrict the work in such a way as to accomplish the greatest amount of good for the largest number of people. In order to furnish specific information

on private water supplies, a bulletin has been prepared, which states briefly what constitutes a good water supply, and describes how it is possible to obtain such a supply. This bulletin will be sent to anyone free of charge. To meet the needs of citizens relative to private water supplies, this Board will investigate such supplies when necessary, provided the individual is willing to pay a portion of the expense involved, i. e., the field expense incurred.

"The State Board of Health may authorize the examination of any water supply in the State at its own expense in cases which relate to communicable diseases, and the above restrictions do not in any way limit emergency investigations.

"Shipped samples of water received from various localities throughout the State are not examined, for the following reasons: A thorough field investigation must be undertaken by a trained observer, at which time information is obtained on the supply regarding its location, environment, construction, treatment, operation, etc. At the time the field investigation is made samples of water are collected for microscopical, bacteriological, physical and chemical examination, as the case may demand. These samples must be collected by a person who understands thoroughly the technique of obtaining satisfactory samples and preparing them for shipment to the laboratory. The field investigation and analytical results together furnish definite information on which an opinion can be given regarding the safety of a water supply. This information furnishes data on which recommendations can be offered to correct unsatisfactory conditions found in the supply."

Methods of Investigating Water Supplies—The investigation of a water supply usually includes engineering, laboratory and office work, both in the field and at the Division headquarters. The field investigation involves sending a trained representative to the locality where the investigation is to be undertaken. In the case of a proposed supply, data are collected on all available sources, in order to give an opinion as to their suitability from a sanitary point of view. If the supply is of underground origin, information is secured relative to the method of obtaining the water so that it will be preserved in a condition satisfactory for public consumption. If the water is to be taken from a surface supply, data are collected as to the suitability of the source and the treatment which will be required to render it satisfactory for public consumption. This Board will not approve any surface water supply without treatment, as open bodies of water are usually subject to contamination at any time. Wherever a storage reservoir and distribution system are contemplated, the sanitary features of these parts of the system are thoroughly investigated. In the case of existing water supplies, detailed information is collected on the source, storage, distribution, and treatment, as the individual case may require. At the time this field work is undertaken, samples of water are collected for bacteriological, microscopical, physical and chemical examination, as the case may demand. These samples are collected with a direct knowledge of field conditions and must be representative of the supply involved, otherwise they are valueless. Samples are collected in outfits especially designed and prepared for this purpose. The bacteriological samples require special preparation before shipment to the laboratory, and this work is accomplished with a portable laboratory outfit.(1) The samples for physical and chemical analysis are collected in standard containers and shipped to the laboratory for examination. Special field equipment is used in testing water treatment plants, which consists of a portable incubator(2) for bacteriological work, a chemical outfit for testing the hypochlorite and liquid chlorine treatment, and an outfit(3) for carrying media.

The laboratory methods used for the examination of samples conform, so far as possible, with the standard methods of the American Public Health Association, Laboratory Section, 1912. The field and analytical methods employed in conducting water investigations have been described in detail in previous publications.(1) (4)

Therefore, a routine water investigation consists of both field and laboratory investigations. By obtaining thorough field and laboratory in-

(1) Public Health Reports, Vol. 29, No. 20, May 15, 1914.

(2) American Journal of Public Health, Vol. 2, No. 12.

(3) Public Health Reports, Vol. 30, No. 9, February 26, 1915.

(4) Minnesota State Board of Health, Biennial Report, 1913.

formation on a water supply, it is possible to determine its potability and, if necessary, to offer recommendations for its improvement or correction.

Plans on proposed supplies, or changes on existing water supplies, are examined on request, but approval is not given until a thorough field investigation is made to obtain exact information regarding the case involved. Final approval of such water supplies will not be given until a routine investigation has been conducted, as outlined above, which shows the supply to be satisfactory for public consumption in every respect.

Portable Emergency Hypochlorite Plant—This Division constantly maintains three portable emergency hypochlorite plants for immediate shipment to any locality within the state where a water-borne infectious disease outbreak has occurred, or where the water supply is known to be contaminated. The field emergency plant was constructed by this Board in 1910, and since that time plants have been kept in readiness for these emergencies. The plant is always accompanied by a technically trained man to install it and put it into operation. Following this, detailed instructions are given to the local authorities regarding the treatment. The plant now in use is very compact, and the entire equipment, exclusive of barrels and stand, including a ten-pound can of hypochlorite, is packed in a small trunk which can be carried in one hand. This plant will conveniently treat one million gallons of water daily, and has treated as much as seven million gallons a day. The plant and all the necessary laboratory equipment for handling a contaminated water supply weighs approximately 165 pounds. The entire equipment can be placed in readiness for shipment in about thirty minutes, and under ordinary conditions it can be installed and put into operation within an hour after reaching the contaminated supply. During this biennial period, plants have been installed at New Ulm and Benson. In each case the distribution system was thoroughly disinfected and the plant kept in operation so that the water could be consumed by the public until the supply was put in a safe condition.

Summaries of Water Supply Investigations—The following short summaries have been prepared from reports on investigations of water supplies that were made for various localities during this biennial period. These summaries have been arranged by counties and localities:

AITKIN COUNTY.

Aitkin—On June 2, 1915, a visit was made to Aitkin (C) for the purpose of consulting with the local authorities regarding a new water supply, at the request of the health officer. It was proposed to obtain this supply from a drilled well. Certain questions regarding the proper construction of a system were discussed.

BECKER COUNTY.

Frazee—On May 5, 1914, an investigation was undertaken on the water supply of St. Paul's Lutheran congregation in Evergreen township, at the request of the local health officer. The supply was obtained from a dug well 25 feet in depth. The field investigation (W) showed the construction of this well to be unsatisfactory. The analytical examination (13561) showed indications of contamination in the supply. Recommendations were made as to the construction necessary to protect this well.

Lake Park—On May 28, 1915, plans were examined for a water supply system (C) for the Clay and Becker counties sanatorium, at the request of the engineers. The plans showed a drilled well and pump of the deep well type. The water is to be pumped into an air pressure tank, from which it will be supplied to the buildings. The plans were recommended for approval.

BELTRAMI COUNTY.

Bemidji—On January 15, 1915, an investigation was undertaken on the public water supply at the request of the local health officer. A satisfactory field investigation was found impossible (M) owing to the fact that separate samples could not be collected from each of the four wells from which the supply was derived. The frozen condition of the area directly surrounding the two new wells also prevented a thorough inspection. The analytical results (14083-14086) showed the absence of contamination in the supply. Recommendations were made for concrete coverings to be placed around and over each of the new wells.

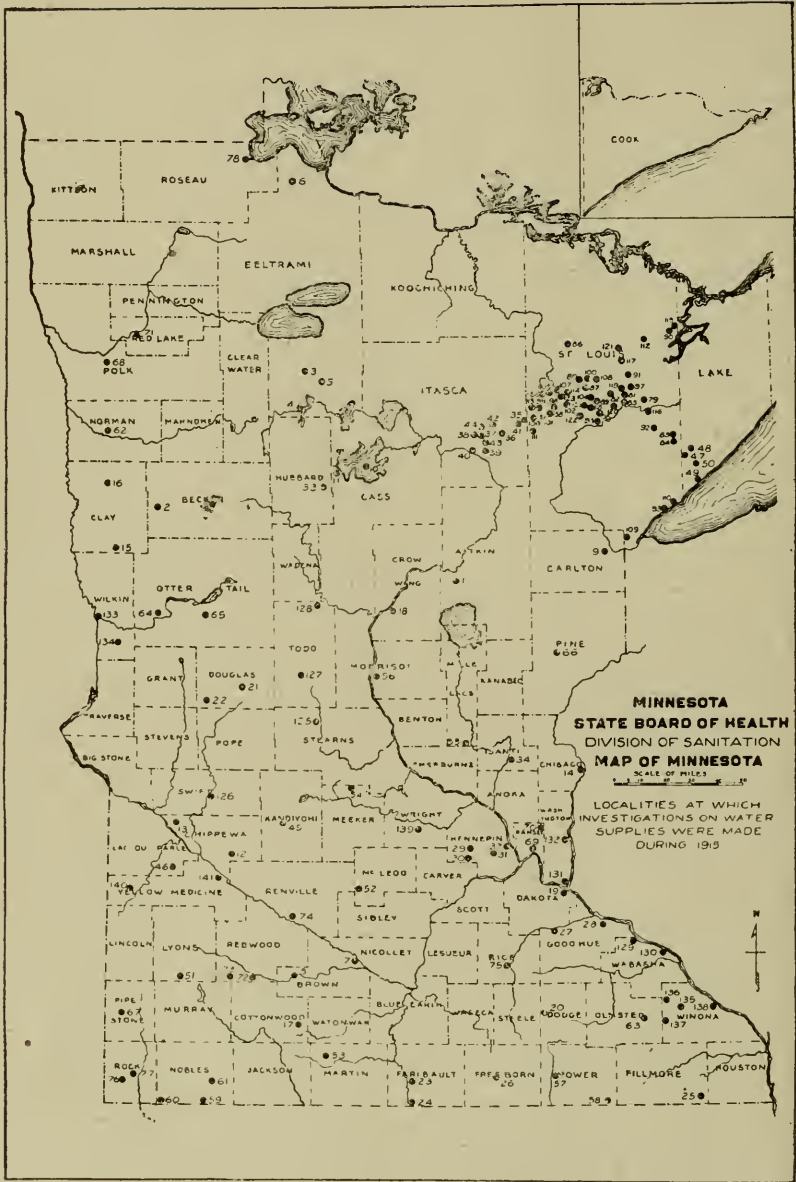
Lake Julia—On March 11, 1915, plans were examined (C) for a water supply system for the Beltrami-Hubbard-Koochiching counties sanatorium, at the request



MAP No. 1

MAP No. 1

No.	Locality	No. of Investigations	No.	Locality	No. of Investigations
1	Frazee	1	60	Beaver Creek	3
2	New Ulm	19	61	Luverne	2
3	Sleepy Eye	1	62	Allen Junction	1
4	Barnum	1	63	Alpena Location	1
5	Cloquet	1	64	Aurora	7
6	Backus	1	65	Biwabik	1
7	Onigum	1	66	Breda	1
8	Taylor's Falls	1	67	Brinson	1
9	Wyoming	2	68	Chisholm	3
10	Barnesville	2	69	Colby	1
11	Moorhead	3	70	Duluth	2
12	Mountain Lake	2	71	Elba Mine	1
13	Brainerd	3	72	Ely	8
14	Crosby	1	73	Embarrass	1
15	Serpent Lake	1	74	Eveleth	1
16	South St. Paul	1	75	Fairbanks	1
17	Elmore	3	76	French River	1
18	Spring Valley	1	77	Genoa Location	1
19	Cannon Falls	2	78	Gilbert	1
20	Zumbrota	1	79	Glen Location	1
21	Deephaven	1	80	Hartley Location	1
22	Excelsior	1	81	Hibbing	5
23	Glen Lake	2	82	Hull-Rust Yards	1
24	Minneapolis	2	83	Kinney	3
25	Bogalusa Location	1	84	Leonidas Location	1
26	Bulgarian Camp	1	85	McKinley	1
27	Coleraine	1	86	Mariska	1
28	Mabel	1	87	Mitchell	1
29	Trout Lake	1	88	Monroe Location	1
30	Heron Lake	4	89	Morris Location	1
31	Hallock	2	90	Mountain Iron	1
32	International Falls	1	91	Myers Location	1
33	Northome	1	92	Norman Location	1
34	Highland	1	93	Palmers	1
35	Knife River	1	94	Penobscot Location	1
36	Two Harbors	1	95	Rainy Junction	1
37	York	1	96	Robinson	1
38	Marshall	1	97	Harold Location	1
39	Stewart	1	98	Skibo	1
40	Milaca	1	99	Sparta	1
41	Little Falls	1	100	Sunnüt	1
42	Currie	3	101	Tower Junction	1
43	North Mankato	1	102	Virginia	1
44	Bigelow	2	103	Winton	2
45	Ellsworth	1	104	Big Lake	1
46	Worthington	1	105	St. Cloud	3
47	Eyota	2	106	Sauk Center	2
48	Rochester	1	107	Owatonna	1
49	Fergus Falls	4	108	Benson	3
50	Pipestone	1	109	Staples	1
51	Crookston	3	110	Brown's Valley	1
52	East Grand Forks	1	111	Hammond	1
53	Fertile	1	112	Mahtomedi	1
54	St. Paul	2	113	St. James	2
55	White Bear	4	114	Breckenridge	1
56	Red Lake Falls	1	115	Campbell	1
57	Sanborn	1	116	Winona	1
58	Farbault	2	117	Maple Lake	1
59	Northfield	1	118	Canby	1



MAP No. 2

MAP No. 2

No.	Locality	No. of Investigations	No.	Locality	No. of Investigations
1	Aitkin	1	71	Red Lake Falls	1
2	Lake Park	1	72	Lamberton	2
3	Puposky	1	73	Walnut Grove	1
4	Bemidji	1	74	Morton	1
5	Spur	1	75	Faribault	2
6	Williams	1	76	Beaver Creek	1
7	New Ulm	4	77	Luverne	1
8	Springfield	2	78	Warroad	4
9	Carlton	5	79	Allen Junction	2
10	Onigum	2	80	Alpena Location	1
11	State Sanatorium	2	81	Aurora	4
12	Maynard	1	82	Biwabik	3
13	Milan	1	83	Breda	1
14	Taylors Falls	1	84	Brimson	2
15	Barnesville	1	85	Colby	1
16	Felton	1	86	Cook	2
17	Mountain Lake	1	87	Deacon Location	1
18	Brainerd	6	88	Duncan Location	1
19	Hastings	1	89	Elba Location	1
20	Claremont	2	90	Ely	3
21	Alexandria	1	91	Embarrass	1
22	Kensington	2	92	Fairbanks	1
23	Blue Earth	2	93	French River	1
24	Elmore	1	94	Genoa Location	1
25	Mabel	1	95	Gilbert	2
26	Albert Lea	1	96	Glen Location	1
27	Cannon Falls	1	97	Graham Location	1
28	Red Wing	2	98	Hartley Location	1
29	Crystal Bay	1	99	Hibbing	4
30	Excelsior	1	100	Hopper	1
31	Hopkins	2	101	Hull-Rust Yards	1
32	Minneapolis	9	102	Kinney	3
33	Akeley	1	103	Leonidas Location	1
34	Braham	1	104	Mariska	1
35	Bennett Mine	1	105	Monroe Location	1
36	Bogalusa Location	1	106	Morris Location	1
37	Bulgarian Camp	1	107	Myers Location	1
38	Coleraine	1	108	Norman Location	1
39	Concentrator Plant	1	109	Nopeming	1
40	Grand Rapids	1	110	Palmers	1
41	Keewatin	1	111	Penobscot Location	1
42	Marble	1	112	Robinson	1
43	Taconite	1	113	Sheridan Location	1
44	Trout Lake	1	114	Shiras Location	1
45	Willmar	1	115	Sibley Location	1
46	Boyd	2	116	Skibo	1
47	Drummond	1	117	Soudan Location	1
48	Highland	3	118	Sparta	1
49	Two Harbors	1	119	Stephens Location	1
50	York	2	120	Summit	1
51	Balaton	1	121	Tower Junction	1
52	Stewart	1	122	Troy Location	1
53	Triumph	1	123	Wanless Location	1
54	Eden Valley	1	125	Melrose	2
55	Princeton	1	126	Benson	1
56	Little Falls	1	127	Long Prairie	1
57	Austin	2	128	Staples	1
58	Le Roy	2	129	Lake City	1
59	Bigelow	1	130	Wabasha	1
60	Ellsworth	1	131	St. Croix River	1
61	Worthington	2	132	South Stillwater	1
62	Ada	2	133	Breckenridge	1
63	Eyota	1	134	Campbell	1
64	Fergus Falls	2	135	Altura	1
65	Battle Lake	1	136	Elba	1
66	Sandstone	1	137	St. Charles	1
67	Pipestone	2	138	Winona	4
68	Crookston	1	139	Waverly	1
69	St. Paul	5	140	Canby	1
70	White Bear	1	141	Granite Falls	2

of the consulting engineer. The water was to be supplied from a drilled well. The plans were recommended for approval.

Spur—On November 2, 1915, an investigation was undertaken (C) on a proposed water supply for the public school building in District No. 99, at the request of the clerk of the school board. A test well had been constructed which indicated that the water could be obtained from a sand and gravel stratum about 35 feet from the surface. A contract had been let for a drilled well. Recommendations were offered regarding the construction.

Williams—On October 14, 1915, an investigation was made on the water supply for the public school building in District No. 91 at the request of the clerk of the school board. A test well had been constructed which indicated that the water could be obtained from a sand and gravel stratum about 35 feet from the surface. A contract had been let for a drilled well. Recommendations were offered regarding the construction.

Williams—On October 14, 1915, an investigation was made on the water supply for the public school building in District No. 91 at the request of the clerk of the school board. The water was obtained from a flowing drilled well 70 feet in depth. The school distribution system had not been installed. The field examination (C) and the analytical results (samples 14499 and 14500) showed this water to be of good sanitary quality.

BROWN COUNTY.

New Ulm—On January 29, 1914, a follow-up investigation was undertaken on the public water supply. The supply was obtained from three drilled wells 180 feet in depth. The field investigation (M) showed that Wells No. 1 and 2 were in a satisfactory condition, while Well No. 3 was open to contamination. The analytical examination (13398-13406) corroborated the field investigation in every instance. Recommendations were offered regarding the construction work necessary to protect Well No. 3 and the disinfection of the supply with hypochlorite.

On February 3-7, 1914, a follow-up investigation was undertaken on this supply to locate, if possible, the exact point of entry of the contamination that caused the typhoid epidemic which existed at that time. An emergency hypochlorite plant was installed to disinfect the supply. The field investigations (M) showed several avenues through which the contamination could have entered. The analytical results on samples collected subsequent to the installation of the hypochlorite treatment (13421-13426) showed the water to be of good sanitary quality. Recommendations were made concerning the construction work necessary to protect this source of supply from future contamination. Advice was given concerning the proper operation of the hypochlorite plant.

On the same dates, a study was made on certain engineering features connected with the entrance of the contamination to the water supply (C) and further recommendations were offered regarding the construction necessary for the future protection of the supply.

On March 18, 1914, a follow-up investigation (M) showed that the hypochlorite plant was still in operation and the treatment was being applied in a satisfactory manner. The analytical results (13493-13498) showed the water to be of good sanitary quality. It was again recommended that proper protection be provided for Well No. 3.

On April 20, 1914, plans for a reinforced concrete covered reservoir for the public water supply were examined (C) at the request of the city engineer. These plans were recommended for approval. On December 17 a field investigation (M) was undertaken at the request of the health officer, which showed that sanitary conditions relating to the reservoir were satisfactory. The analytical data (14043-14050) showed indications of a limited amount of contamination in three samples. The contamination was found to originate from recent construction work on the system and inadequate pumping to cleanse one of the wells. It was recommended that the well which showed contamination be shut off from the system and pumped to waste for a considerable period of time, and that all the wells and the system be thoroughly sterilized with hypochlorite.

On January 26, 1915, a follow-up investigation was undertaken (W) on this water supply. It was said at this time that the wells had been treated with hypochlorite to remove the contamination found at the time of the previous investigation. It was found that Well No. 3 had been abandoned. The analytical results (14107-14111) showed the absence of dangerous contamination in the supply.

On December 10, 1915, an investigation was undertaken at the request of the health officer. The supply at this time included Well No. 3, which had just recently been completed. The field data (M) showed that conditions relating to the new well were unsatisfactory on account of an opening between the pump and the well casings. They also showed an unsatisfactory condition relating to Wells No. 1 and No. 2. The analytical data (14576-14581) showed the supply in Well No. 3 to be free from contamination, and the supply in Well No. 1 to contain a limited amount of contamination. Recommendations were made for construction to eliminate the unsatisfactory conditions.

On January 30, 1914, an investigation was undertaken on a water supply obtained from Waxipathi spring, at the request of the health officer. The field investigation (M) showed that this spring was not properly protected and that the method of drawing water was unsatisfactory. The analytical results (13407) substantiated these findings and showed indications of a limited amount of con-

tamination in this supply. Recommendations were made regarding the construction necessary to protect the source from a sanitary point of view.

On June 1, a follow-up investigation was undertaken on this spring. The field inspection (M) showed that excellent protection had been provided to guard against the entrance of surface water. The analytical examination (13550 and 13551) showed indications of a very limited amount of contamination. This was probably contributed during the time the construction work had been done. It was recommended that the spring be disinfected with hypochlorite, and directions were provided to carry out this work.

On September 10 a follow-up investigation was undertaken on this spring. It was learned at the time of the field investigation (M) that the disinfection recommended at the time of the previous investigation had been carried out. The analytical examination (13799) showed indications of contamination.

On December 17 another investigation was undertaken on the supply from this spring. The field investigation (M) showed that the supply was properly protected. The analytical data (14052 and 14053) showed the absence of contamination in the supply. The spring was found to be a safe source from which to obtain drinking water.

On March 18, 1914, an investigation was undertaken on the water supply at the P. P. Manderfeld residence, in Cottonwood township, at the request of a local physician. The supply was obtained from a drilled well 200 feet in depth. The field investigation (M) showed this supply to have a very unsatisfactory environment. The analytical results (13499 and 13500) showed indications of contamination. Recommendations were made regarding changes in the environment and protection of the well.

On September 10, 1914, an investigation was undertaken on a private water supply located at 302 Franklin street south at the request of the local health officer. The supply was obtained from a dug well 60 feet in depth. The field investigation (M) showed conditions which were unsatisfactory, while in the analytical examination (13795) indications of contamination were found. Recommendations were made regarding the construction necessary to protect this well from surface contamination.

On September 10, 1914, an investigation was undertaken on a private water supply located at 15 Payne street north at the request of the health officer. The supply was obtained from a dug well 30 feet in depth. The field investigation (M) showed the environment and construction to be unsatisfactory, and the analytical examination (13796) showed indications of contamination in the water. Recommendations were made regarding construction necessary to protect the well from surface contamination.

On September 10, an investigation was undertaken on a private water supply located at Summit avenue and Fourth street at the request of the health officer. The supply was obtained from a dug well 31 feet in depth. The field investigation (M) showed the environment and construction of the well to be faulty, and the analytical examination (13797) showed indications of contamination in the water. Recommendations were made regarding the construction necessary to protect this well from surface contamination.

On September 10 an investigation was undertaken on a private water supply located at 101 North Payne street at the request of the local health officer. The supply was obtained from a dug well 30 feet in depth. The field investigation (M) showed conditions which were unsatisfactory in regard to construction and environment. The analytical results (13800) showed indications of contamination in the water. Recommendations were made regarding the construction necessary to protect this well from surface contamination.

On September 10 an investigation was undertaken on a private water supply at the residence of Fred Regulin at the request of the health officer. The supply was obtained from a drilled well 35 feet in depth. The field investigation (M) showed conditions which were unsatisfactory in regard to the construction of the well. The analytical data (13807 and 13802) showed indications of contamination in the water. Recommendations were made regarding the construction necessary to protect this well from surface contamination.

On September 10 an investigation was undertaken on a private water supply at Summit avenue and Third street south at the request of the health officer. The supply was obtained from a dug well 20 feet in depth. The field investigation (M) showed conditions which were unsatisfactory from a sanitary point of view. The analytical data (13798) showed indications of contamination in the water. Recommendations were made regarding the construction necessary to protect this well from surface contamination.

On September 10 an investigation was undertaken on the spring located at the intersection of Eighth street south and Valley street. The field investigation (M) showed conditions which were unsatisfactory, and these findings were corroborated by the analytical results (13794.) It was recommended that the construction of this supply be improved in order to eliminate surface contamination.

On December 17 an inspection was made on this spring at the request of the local health officer. The field investigation (M) showed that satisfactory protection was being provided to guard this supply from surface contamination. The analytical data (14051) showed the absence of contamination. This supply was found to be suitable for public consumption.

On December 10, 1915, a follow-up investigation was undertaken on this spring. The field investigation (M) showed conditions which were satisfactory, and the analytical results (14582) substantiated these findings.

Sleep Eye—On March 18, 1914, an investigation was undertaken on a proposed water supply at the request of the health officer. The supply was obtained from a 196-foot well, located in the basement of the public school building. The field investigation (M) showed the well to be satisfactory from a sanitary point of view. The analytical results (13501 and 13502) showed the absence of dangerous contamination in the water. It was recommended that this well be used in place of one of the city wells in use at that time, which was in an unsafe condition.

Springfield—On January 27, 1915, an investigation was undertaken on the public water supply at the request of the president of the village council. The supply was obtained from four 30 to 35-foot drilled wells. The field investigation (W) showed conditions which were not satisfactory from a sanitary point of view. The analytical data showed the water to be of good sanitary quality. It was recommended that a thorough investigation be made of all wells, and repairs were suggested which would exclude water from the well pits.

On October 26 a follow-up investigation was undertaken on this supply. It was found (C) that the recommendations made at the time of the previous investigation had not been carried out. The analytical results (14512-14514) showed the water to be of good sanitary quality. It was recommended that the recommendations already offered be complied with.

CARLTON COUNTY.

Barnum—On July 15, 1914, an investigation was undertaken on the water supply for the public school building in District No. 22 at the request of the clerk of the school board. The field investigation (M) showed several features which required improvement. The analytical results (13675 and 13676) showed no evidences of contamination. Recommendations were made regarding the changes in construction and environment necessary for the protection of the supply.

Carlton—On February 19, 1915, an investigation was undertaken on four wells maintained by the village for public use at the request of the health officer.

Well No. 1 was a dug well 15 feet in depth, located on Chestnut street, north of Lot 6, Block 7. The field investigation (W) showed conditions which were unsatisfactory from a sanitary point of view, while in the analytical results (14159) indications of contamination were not found. Recommendations were made on construction which would properly protect this supply.

Well No. 2 was a dug well 15 feet in depth, located on Chestnut street, opposite the Presbyterian church. The field investigation (W) showed that the construction and environment of the well were unsatisfactory. The analytical results (14160) did not show indications of contamination. Recommendations were made as to the proper construction of a well of this type.

Well No. 3 was a dug well 16 feet in depth, located on South street between Dumphy's store and Lee's residence. The field investigation (W) showed that the construction of the well was unsatisfactory, while in the analytical results (14161) indications of contamination were not found. Recommendations were made for construction which would properly protect this supply.

Well No. 4 as a 15-foot dug well, located on Front street, on the front of Block 10, Lot 7. The field investigation (W) showed that the construction of the well was unsatisfactory, while in the analytical results (14162) indications of dangerous contamination were not found. Recommendations were made for construction which would properly protect this supply.

On July 21, 1915, an investigation was undertaken on a proposed public water supply at the request of the president of the village council. Drilling was begun on a well late in 1913 and continued to the spring of 1915, during which time a depth of 1,103 feet was reached. Water was not obtained in sufficient quantities to use this well as a source of supply. The present investigation was undertaken to advise the village regarding the use of Otter Creek. The field investigation (W) showed Otter Creek to be open to contamination at all times, and the analytical examination (14347 and 14348) showed indications of contamination. It was advised that the water could not be considered safe for consumption without filtration and chemical treatment. It was suggested that the question of a dug well be investigated.

Cloquet—On May 11, 1914, an investigation was undertaken on the public water supply at the request of the local health officer. The supply was obtained from springs, on which a previous investigation was made on July 22, 1913, at which time recommendations were made for the improvement of the supply. The field investigation (M) showed that these recommendations had not been complied with. The analytical results (13585 to 13588) showed the water to be of good sanitary quality. Recommendations were made that the previous advice be carried out.

CASS COUNTY.

Backus—On September 1, 1914, an investigation was undertaken on the water supply for the building in Consolidated School District No. 1. The supply was obtained from a driven well. The field investigation (C) showed the possibility of the water supply becoming contaminated from water standing in the well pit. No

samples were collected. Recommendations were made for construction to correct this dangerous condition.

Onigum—On February 27, 1914 an investigation was undertaken on the water supply at the Leech Lake Indian agency at the request of the United States Indian agent. The field investigation (W) showed two sources of supply, one from Leech Lake and the other from a dug well 20 feet in depth. The water from Leech Lake was found to be unsatisfactory for drinking purposes without purification, although the analytical results (13445) showed it to be of good sanitary quality at that season of the year. The dug well was found to be improperly constructed and operated, and the analytical results (13446 and 13447) showed the water to be highly polluted. It was recommended that steps be taken to secure a satisfactory water supply. It was also suggested that a water supply from an underground source which was properly located, constructed and operated would be most satisfactory from a sanitary point of view.

On January 13, 1915, an investigation was undertaken on a new 58-foot drilled well at the request of the superintendent of the Leech Lake Indian Agency School. The field investigation (M) showed that conditions relating to this supply were satisfactory so far as could be determined at that time. The analytical results (14080 to 14082) showed the presence of a limited amount of contamination. This was explained by the fact that the well had been completed but recently.

On February 26 a follow-up investigation was undertaken on this water supply. The field investigation (M) showed an opening at the top of the well casing, and the analytical results (14183 to 14185) showed indications of a limited amount of contamination in the supply. Recommendations were made for the closing of this opening.

State Sanatorium—On February 26, 1915, an investigation was undertaken on the water supply of this institution at the request of the superintendent. The supply was obtained from a small arm of Leech Lake and pumped to the distribution system without treatment. The field investigation (M) showed the supply to be open to serious contamination. The analytical results (14180 to 14182) showed the presence of contamination in the supply direct from the lake and in the distribution system. It was recommended that the supply from Leech Lake be discontinued and that an underground supply be installed.

On December 15, 1915, an investigation was undertaken on this water supply, which at this time was passed through a mechanical sand filter of the pressure type, and subsequently treated with hypochlorite. The field investigation (C) showed the operation of the filter to be unsatisfactory, apparently due to improper operation. Recommendations were offered for the washing of the filters and the application of the calcium hypochlorite.

CHIPPEWA COUNTY.

Maynard—On November 30, 1915, an investigation was undertaken on the public water supply at the request of the clerk of School District No. 30. The supply was obtained from an 83-foot drilled well, and stored in a concrete reservoir and steel air pressure tank. With one minor exception the field investigation (C) showed this supply to be in good condition from a sanitary point of view. The analytical results (14548 to 14550) showed the water to be of good sanitary quality.

Milan—On September 22, 1915, an investigation was undertaken on the public water supply at the request of the clerk of School District No. 45. The supply was obtained from a dug well 28 feet in depth, which was found to be open to contamination. Both the field investigation (C) and the analytical results (14440 to 14442) showed this supply to be unsafe for public consumption. Recommendations were offered for the protection of the supply.

CHISAGO COUNTY.

Taylor's Falls—On March 21, 1914, an investigation was undertaken on the public water supply at the request of the local health officer. The supply was obtained from springs. The field investigation (W) showed that the water was being obtained from points too near the surface to be safe, from a sanitary point of view. The analytical results (samples 13506 to 13508) showed the presence of a limited amount of contamination in the water. Recommendations were made to increase the depth of the surface over the collection area at the spring, and also regarding

On February 16, 1915, a follow-up investigation was undertaken on this supply. The field investigation (W) showed that certain of the recommendations made at the time of the previous visit had been carried out, while others had not. The analytical results (14154 to 14157) showed the absence of dangerous contamination in the water at this time. It was found that the area over the underdrain system was not sufficiently protected with surface soil to allow for proper filtration. Recommendations were made concerning this defect.

Wyoming—On March 11, 1914, a follow-up investigation was undertaken on the water supply of the Northern Pacific Railway company. The water was obtained from a driven well 25 feet in depth. The field investigation (M) showed that the recommendations made at the time of the previous investigation, July 21, 1913, had not been complied with. The analytical results (13486 and 13487) showed the

water to be of questionable sanitary quality. It was recommended that the protection advised in the previous report be installed.

CLAY COUNTY.

Barnesville—On May 6, 1914, a follow-up investigation was undertaken on the water supply of the Great Northern Railway company. The supply was obtained from Whiskey Creek without purification. The field investigation (W) showed that this supply was distributed about the properties of the company, but it was said that it was not being used for drinking purposes. The analytical data (13570 and 13571) showed the water to be highly polluted.

On November 20, 1914, an investigation was undertaken on the water supply of the Great Northern Railway company. This supply was obtained from a dug well 12 feet in depth. The field investigation (M) showed that the well was not properly constructed and protected. These results were substantiated by the analytical data (13944). Recommendations were made against the use of this source of supply in its existing condition.

On August 19, 1915, an investigation was undertaken on the water supply of the Great Northern Railway company at the request of the company. The field investigation (W) showed conditions which were unsatisfactory, and in the analytical results (14390) indications of contamination were found. It was recommended that certain changes be made in the construction of the well in order to eliminate the possibility of surface contamination.

Felton—On November 16, 1915, an investigation was undertaken on the water supply of the consolidated school building in District No. 75 at the request of the clerk of the school board. The supply was obtained from a 140-foot drilled well. The field investigation (W) showed that the well had been installed, but was not connected with the building. No analytical examination was made. Advice was given regarding the proper method of making certain connections and storing the water.

Moorhead—On January 5, 1914, an investigation was undertaken on the public water supply at the request of the Water and Light Department. The field investigation (C) showed the supply to be obtained from the Red River and to be treated with hypochlorite. No analytical investigation was undertaken. Suggestions were furnished regarding the operation of the hypochlorite plant.

On March 1, 1914, an investigation was undertaken on the public water supply at the request of the Water and Light Department. The supply at this time was obtained from two sources, the Red River, after being subjected to hypochlorite treatment, and from two drilled wells. The field investigation (W) on the water from the Red River showed the hypochlorite plant to be operated in a satisfactory manner. The analytical examination (13463 to 13465) showed the treated water to be of good sanitary quality. The field examination of the two drilled wells showed that they were improperly protected from surface contamination. The analytical results (13466 to 13469) showed the water in one of these sources to be of questionable sanitary quality. Recommendations were made regarding the improvements on the operation of the hypochlorite plant and also on the construction which would be necessary to make the drilled wells safe sources of supply.

On May 6, 1914, a follow-up investigation was undertaken on this supply. The field investigation (W) showed that the hypochlorite plant was being operated in a satisfactory manner, and these findings were corroborated by the analytical results (13562 to 13565). The field investigation also showed that a portion of the recommendations made on the drilled wells at the time of the previous investigation had been complied with, but were not completed. The analytical results (13566 to 13569) showed the water from these sources to be of good sanitary quality. Attention was again called to the fact that the recommendations of the previous report should be complied with.

COTTONWOOD COUNTY.

Mountain Lake—On January 27, 1914, an investigation was undertaken on the public water supply at the request of the mayor. The supply was obtained from two dug wells 40 and 44 feet in depth. A drilled well 335 feet in depth had been installed. The field investigation (M) showed the dug wells to be improperly protected, and these findings were corroborated by the analytical results (13392 to 13394). Recommendations were made concerning the construction work necessary to make these wells safe sources of supply.

On December 11, 1914, an investigation was undertaken on this water supply at the request of the mayor. The field investigation (M) showed that the recommendations contained in the previous report had been carried out. The analytical data (14030 to 14033) showed the absence of contamination in the supply. The supply was found to be satisfactory for public consumption.

On December 9, 1915, a follow-up investigation was undertaken on this water supply. The field data (M) showed that certain protective construction had been installed in the emergency well. The analytical data (14572 to 14575) showed indications of contamination in the supply from the emergency well, and a limited amount of contamination in that from the combined dug and drilled well. Recommendations were made for protective construction.

CROW WING COUNTY.

Brainerd—On March 3, 1914, a follow-up investigation was undertaken on the public water supply. This constituted one of the routine investigations on the efficiency of water purification plants throughout the State. The supply was obtained from the Mississippi River and treated with hypochlorite. The field investigation (W) brought out the fact that the hypochlorite plant which had been installed previously as a temporary expedient should be replaced by a more permanent and efficient method of purification, or a supply obtained from an underground source. The analytical results (13477 to 13480) showed the treated water to be of good sanitary quality. It was recommended that, if the use of Mississippi River water was to be continued, the purification required be filtration and chemical treatment. It was suggested that, if possible, a water supply be obtained from an underground source.

On May 5 a follow-up investigation was undertaken on the public water supply. The field investigation (W) showed that the hypochlorite plant was being operated as satisfactorily as could be expected with the apparatus then in use. The question of a new water supply for the city was still under consideration. The analytical results (13549 to 13553) showed the absence of dangerous contamination in the water. It was recommended that a competent engineer be employed to make a careful study of the water problem, and that this material be submitted to this Board for suggestions.

On January 12, 1915, a follow-up investigation was made on the public water supply. The field investigation (M) showed that the hypochlorite plant was being operated in a very satisfactory manner. The analytical data (14075 to 14079) showed the absence of contamination in the treated water. The supply was found to be of good sanitary quality and suitable for public consumption.

On May 12, 1915, an investigation was made of this water supply with a view of checking up the efficiency of the hypochlorite treatment, at the request of the Water and Light Board. The field investigation (M) showed that the mechanical operation of the plant was being carried on in a satisfactory manner. Owing to an inferior grade of chemical in use the amount of active chemical entering the supply was insufficient. A new stock was obtained which was of standard strength and should produce satisfactory results. The analytical data (14228 to 14232) showed the presence of a limited amount of contamination in the supply.

On the same date an inspection was made of two groups of test wells for a proposed public water supply for the city. This work was done at the request of local officials. The field investigation (M) showed this location to be very satisfactory when judged from a sanitary point of view. The analytical results (14226 and 14227) corroborated the field findings in showing the supply to have been free from contamination.

On November 1, 1915, an investigation was undertaken on two new five-inch wells at the request of the Water and Light Commission. The investigation was made to determine whether the water from these wells was suitable for public consumption. It was found (C) that the water was satisfactory from a bacteriological standpoint (14515 to 14518), but the iron content was extremely high, and the water would be objectionable for certain domestic and industrial uses.

On December 29, 1915, an investigation was undertaken on the proposed water supply at the request of the Water and Light Board. It was found (C) that the water from the wells in Groups 1 and 2 and from the new five-inch drilled well was satisfactory from a bacteriological standpoint (14638 to 14641). The water from the wells in Groups 1 and 2 was found to be satisfactory from an aesthetic point of view, but that from the new well was found to have a high iron content, which would probably make it objectionable.

On May 5, 1914, an investigation was undertaken on a community water supply on the property of Mr. William Graham at his request. The supply was obtained from a drilled well 140 feet in depth. The field investigation (W) showed that the construction of this well was unsatisfactory, while in the analytical results (15553) indications of dangerous contamination were not found. It was recommended that a water-tight covering be installed for the well pit, and means be provided for carrying away the waste water from this well.

On January 12, 1915, a follow-up investigation was made on this water supply. The field investigation (M) showed that ample protection was being provided to guard against surface contamination. The analytical results (14074) showed the absence of contamination. The supply was found to be satisfactory for public consumption.

Crosby—On August 31, 1914, an investigation was undertaken on the public water supply at the request of a local citizen. The supply was obtained from eight well points driven to an average depth of 70 feet. The field investigation (C) showed water standing in the pit in which the suction pipes are located, and also an emergency intake to Serpent Lake. The analytical results (13759 to 13761) showed the water to be of excellent sanitary quality. It was recommended that the pit in the pumping station be either filled up or kept pumped out, and that the emergency connection be abandoned.

Serpent Lake, Deerwood—This investigation was undertaken on August 14, 1914, as part of an investigation connected with the disposal of sewage for the Village of Deerwood. The investigation of the sanitary quality of Serpent Lake was undertaken to obtain data as to the condition of the lake before any sewage was dis-

posed of therein. The field investigation (C and W) and analytical results (13749 to 13753) showed that the lake was an unsatisfactory source from which to obtain water for drinking purposes without purification.

DAKOTA COUNTY.

Hastings—On February 5, 1915, an investigation was undertaken on the public water supply at the request of the Chicago, Milwaukee & St. Paul Railway company. This supply was obtained from a 475-foot drilled well. The field investigation (M) showed that an excellent protection had been provided to guard this well from contamination. The analytical results (14129 to 14132) showed that no contamination was present in the supply, and it was recommended for public consumption.

South St. Paul—On October 26 to November 6, 1914, an investigation was conducted on the water supply of the Union Stock Yards company at the request of the executive officer. The employees at the Stock Yards were suffering from an epidemic of dysentery, and investigations had pointed out the water supply as the source of this disease. The work of this division was to investigate conditions causing the contamination and, if necessary, to apply the hypochlorite treatment to remove it from the system, and to make recommendations for the future protection of the supply. The field investigations (C and W) showed that the water supply, which was obtained from three drilled wells, had become contaminated through certain connections which were maintained with the supply of Swift & Company, a part of which was obtained from the Mississippi River and was used at irregular intervals for fire protection. The hypochlorite treatment was applied to eliminate the contamination which the analytical results (13937 to 13946 and 13968 to 13972) showed was present in the system. Recommendations were made concerning the removal of certain connections which would eliminate the possibility of future contamination from the Mississippi River entering the distribution system. These were immediately complied with. Further recommendations were made regarding the improvement of the well water supply of the company.

DODGE COUNTY.

Claremont—On August 31, 1915, an investigation was undertaken on the public water supply at the request of the clerk of School District No. 58. The supply was obtained from a drilled well located at the pumping station. Both the field investigation (C) and the analytical results (14400 to 14402) showed the water to be unsafe for public consumption. Recommendations were offered for improving the supply.

On December 21, 1915, a follow-up investigation was undertaken on this water supply. The field data (M) showed that extensive improvements had been made since the time of the last inspection. A defect still existed in the sewer connection with the well pit. The analytical results (14617 to 14619) showed the supply to have been free from contamination at this time. Recommendations were made for the removal of the sewer connection and for the disposal of waste water which might enter the well pit.

DOUGLAS COUNTY

Alexandria—On October 14, 1915, an investigation was undertaken on the public water supply at the request of the president of the Board of Public Works. The supply was obtained from a 103-foot drilled well, installed during the past year. For emergency purposes the pumps were connected with the dug well, which formerly constituted the source of supply, and with Lake Winona, a polluted body of water. The field investigation (W) showed the supply from the new drilled well to be satisfactory from a sanitary point of view. The analytical results (14484 to 14488) showed the water from the new well to be of excellent sanitary quality. The field and analytical data also showed that the well formerly used must be improved before it could be considered a safe source. Recommendations were made for protective construction and for the breaking of the connection with Lake Winona.

Kensington—On August 19, 1915, an investigation was made on the water supply at the public school building. The supply was obtained from a drilled well 110 feet in depth. The field investigation (W) showed conditions which were unsatisfactory from a sanitary point of view, and in the analytical results (14383 and 14384) indications of contamination were found. It was recommended that certain changes in environment and construction be made in order to render the supply satisfactory from a sanitary point of view.

On the same date an investigation was undertaken on the public water supply at the request of the local health officer. The supply was obtained from a dug well 80 feet in depth. The field investigation (W) showed conditions which were very unsatisfactory from a sanitary point of view. No analytical examination was made. It was said that the water was not used for drinking purposes. Certain advice was furnished so that this source could be improved and used for public consumption. It was suggested that the village consider the installation of a public water supply which could be generally used throughout the village.

FARIBAULT COUNTY.

Blue Earth—On March 11, 1915, an investigation was undertaken on the public water supply at the request of a member of the State Board of Health. The supply was obtained from two drilled wells 210 and 675 feet in depth. The field investigation (W) showed conditions which were satisfactory as regards the sources of supply, but minor changes would be necessary to protect the underground reservoir. Complaints had been common regarding the physical and chemical properties of the water. The analytical investigation (14196 to 14200) showed the water to be of excellent sanitary quality. The physical and chemical properties of one of the wells was objectionable from an aesthetic point of view. Recommendations were made concerning the construction of the underground reservoir and a change in the depth of one of the wells.

On August 11, 1915, a follow-up investigation was undertaken on this water supply to determine whether the recommendations contained in the previous report had been complied with. The field investigation (M) showed that an effort was made to follow out these recommendations by placing a layer of concrete around the opening in the reservoir and constructing a flat slab for fitting over it. This method of protection was not according to the instructions given in the previous report. It was advised that the recommendations be followed to the letter in order that this supply might receive satisfactory protection from surface contamination.

Elmore—On January 27, 1914, a follow-up investigation was undertaken on the public water supply at the request of the Chicago, St. Paul, Minneapolis & Omaha Railway company. The supply was obtained from a drilled well 150 feet in depth. The field investigation showed that the recommendations made in the previous report on this supply had not been satisfactorily complied with. The analytical results (13395 to 13397) showed certain samples of this water to be of questionable sanitary quality. Recommendations were again made regarding the proper construction work to protect this supply.

On April 4 an investigation was undertaken on this supply. This was the third investigation made with a view of inducing the local officials to improve the supply. The field investigation (W) showed that the supply was still in an unsatisfactory condition. The analytical results (13517 to 13519) showed the water to be of good sanitary quality. Recommendations were made regarding construction necessary to protect the supply.

On December 12 an investigation was undertaken on the public water supply. The field investigation (M) showed that the conditions were not satisfactory, even though the analytical results (14035 and 14036) showed the water to be of good sanitary quality. Recommendations were made for construction necessary to protect this supply.

On March 11, 1915, a follow-up investigation was undertaken on this water supply. This was the fifth of a series of investigations undertaken during the past two years to induce the officials to protect the source of supply. It was found (W) that certain recommendations which were made previously had been complied with, while others had not. The local officials were strongly urged to comply with all recommendations and avoid any serious results.

FILLMORE COUNTY.

Mabel—On December 22, 1915, a follow-up investigation was made on the public water supply, which is obtained from a 140-foot drilled well. The field investigation (M) showed unsanitary conditions surrounding the top of the well casing. Plans had been formulated for the installation of an electrical pump to replace the steam pump now in use. Suggestions were made for protective construction to be installed at the time the new pump was set up. The analytical data (14630 to 14632) showed the absence of contamination in the supply. Recommendations were made for protective construction.

Spring Valley—On September 7, 1914, an investigation was undertaken on the public water supply at the request of a local citizen. The supply was obtained from two 15-foot dug wells. The field investigation (M) showed that the protection of both these wells was unsatisfactory from the standpoint of their construction. The analytical results (13763 to 13767) showed the presence of a limited amount of contamination in both sources and in the distribution system. Recommendations were made concerning the environment and construction of these wells, which would make them safe sources of supply.

FREEBORN COUNTY.

Albert Lea—On March 16-17, 1915, an investigation was undertaken on the public water supply at the request of the executive officer. This investigation was made to determine the relationship existing between the water supply and numerous cases of typhoid fever prevalent in the city at that time. The supply was obtained from two drilled wells 448 and 660 feet in depth. Another drilled well owned by the Albert Lea Packing company was held as an emergency supply. The field investigation (M) showed that the sanitary conditions relating to these wells were satisfactory, but that there was a lack of proper protection for the underground reservoir. The analytical results (14202 to 14207) showed the supply to be free from contamination. Recommendations were made for a direct connection between the pumps and well casings or for a satisfactory protection around the underground reservoir.

GOODHUE COUNTY.

Cannon Falls—On January 29, 1914, an investigation was undertaken on the public water supply at the request of the health officer. The supply was obtained from a drilled well about 300 feet in depth. The field investigation (W) showed the source of supply to be well protected, while the reservoir for storing the water supply was in an unsatisfactory condition. The analytical results (14386 to 14388) showed the water to be of good sanitary quality. Recommendations were made concerning improvements on the reservoir.

On February 11, 1915, a follow-up investigation was undertaken on this water supply. The field investigation (M) showed that the former recommendations were carried out and that a good protection had been provided to exclude surface waste materials from the reservoir. The analytical results (14148 to 14150) showed the absence of indications of contamination in the water.

On September 9, 1914, an investigation was undertaken on the proposed water supply for the Goodhue County Sanatorium at the request of the consulting architects. The investigation (C) showed that the proposed source was a spring located near the north bank of the Cannon River. Recommendations were made regarding the protection of this spring, if it was finally decided to use it. The use of a drilled well was suggested.

Red Wing—On February 9, 1915, an investigation was undertaken on the water supply for the Chicago, Milwaukee & St. Paul Railway company at their request. This supply was obtained from a flowing well 465 feet in depth. The field investigation (M) showed that the unsealed top of the well casing in the bottom of the well pit was open to contamination from the river, which backs into the well pit during the flood periods through the line of drain pipe. An opening between the pump and well pits also admits waste water flowing over the floor of the pump pit. The analytical results (14133 and 14134) showed that a limited amount of contamination was present in the supply at this time. Recommendations were made for the installation of such construction as would preclude the possibility of contamination from the points mentioned.

On August 31, 1915, a follow-up investigation was undertaken on this water supply. It was found (M) that a water-tight protection had been provided around the well to insure the elimination of surface contamination. The analytical data (14396 and 14397) showed the supply to be free from contamination at this time.

Zumbrota—On January 30, 1914, a follow up investigation was undertaken on the public water supply at the request of the Chicago & Northwestern Railway company. The supply was obtained from a drilled well 230 feet in depth. The field investigation (W) showed conditions which were satisfactory from a sanitary point of view, and these findings were corroborated by the analytical results (13389 and 13390).

HENNEPIN COUNTY.

Crystal Bay—On September 2, 1915, an investigation was undertaken on the water supply of the public school building at the request of the local school board. The supply was obtained from a dug well 16 feet in depth. The field investigation (W) showed the well to be improperly constructed, with ample opportunity for its contamination. The analytical results (14399) showed the presence of a limited amount of contamination in the water. Recommendations were made regarding the proper construction of the well.

Deephaven—On June 11, 1914, an investigation was undertaken on the water supply at the residence of Mr. R. Bennett at the request of the executive officer. The supply was obtained from a dug well 16 feet in depth. The field investigation (W) showed that there was ample opportunity for pollution to reach this well through the casing and covering. The analytical results (14638) showed indications of contamination in the supply. Recommendations were made concerning the type of construction which would be required to make this supply safe.

Excelsior—On March 28, 1914, an investigation was undertaken on the water supply of the public school building at the request of the health officer. The supply was obtained from a drilled well, said to be from 100 to 125 feet in depth. The field investigation (M) showed the well to be properly protected and constructed. The analytical results (13490 and 13491, 13509 and 13510 and 13521 and 13522) showed indications of contamination in the water. The distribution system throughout the building was sterilized with hypochlorite, which removed the indications of contamination.

On October 4, 1915, an investigation was undertaken on the water supply for the new public high school at the request of the school board. The supply was obtained from a drilled well 75 feet in depth. The field data (M) showed satisfactory conditions surrounding the well, except for an opening in the floor through which waste water is drained into the soil. The analytical data (14451 and 14452) showed the presence of contamination in the supply. It was explained that this might be the remains of contamination contributed during the time of construction. Recommendations were made for the closing of the opening in the floor and for the disinfection of the well and distribution system with hypochlorite.

Glen Lake—On July 24, 1914, an investigation was undertaken on plans for the proposed water supply at the Glen Lake Sanatorium, at the request of the architects. The plans were approved with the suggestion that care be taken to prevent surface contamination.

On August 28, 1914, plans were examined on the water supply, at the request of the consulting engineers. These plans showed the boiler room, pump room, well location, pumps and pressure tank. The plans were approved.

Hopkins—On August 25, 1915, an investigation was undertaken on the public water supply at the request of the clerk of School District No. 19, Hennepin county. The water supply was obtained from a drilled well 900 feet in depth on the property of the Minneapolis Threshing Machine company. The field investigation (C) showed this supply to be open to contamination from surface water. The analytical results (14392 to 14395) indicated a water of good sanitary quality. Recommendations were offered for construction to protect the supply.

On December 13, 1915, a follow-up investigation was undertaken on the water supply. It was found (C) that two of the five recommendations made at the time of the previous investigation had been satisfactorily complied with, that a third had been partially carried out, and that the other two would be completed. Information received subsequent to the investigation indicated that the remainder of these recommendations had been complied with. The analytical results (14586 to 14589) indicated the water to be of good sanitary quality.

Minneapolis—On March 13, 1914, an investigation was undertaken on the water supply of the Minneapolis, St. Paul, Rochester & Dubuque Railway, located at their shops at Sixtieth street and Nicollet avenue, at the request of the company. The supply was obtained from a drilled well 165 feet in depth. The field investigation (M) showed the source of supply to be satisfactory. The analytical results showed the water to be of good sanitary quality. It was recommended that more substantial covering be placed over the storage tank.

On December 2 a follow-up investigation was undertaken on this supply. The field investigation (M) showed that the recommendations of the previous report had been complied with, and the analytical results (14006 and 14007) indicated the water to be of good sanitary quality. These results indicate this supply to be suitable for public consumption.

On February 10 an investigation was undertaken on the water supply of the Northern Pacific Railway company at Tenth avenue north and Second street. This supply was obtained from a drilled well 238 feet in depth. The field investigation (W) showed conditions which were unsatisfactory from a sanitary point of view, while in the analytical results (14142 and 14143) indications of contamination were not found. Recommendations were made regarding the construction of the well pit and the extension of the well casing with a view of safeguarding this supply.

On April 28 a follow-up investigation was undertaken on this water supply. The field investigation (W) showed that the recommendations made in the previous report had been complied with. The analytical results (14224 and 14225) showed the water to be of good sanitary quality. This supply was recommended as safe for public consumption.

On June 11, 1915, an investigation was undertaken on the water supply of the Northern Pacific Railway company, located at the west end of the transfer platform at Northtown, at the request of the company. The supply was obtained from a combined dug and driven well 16 feet in depth. The field investigation (W) showed that the construction of this well was unsatisfactory, while in the analytical examination (14256) indications of contamination were not found. Recommendations were offered regarding the construction and protection of the well.

On June 11, 1915, an investigation was undertaken on the water supply of the Northern Pacific Railway on the main line at Northtown at the request of the company. The supply was obtained from a drilled well 361 feet in depth. The field investigation (W) showed that the construction and environment of this well were not satisfactory from a sanitary point of view, while in the analytical examination (14252 and 14253) indications of contamination were not found. Recommendations were made regarding both construction and environment.

On June 11, 1915, an investigation was undertaken on the water supply of the Northern Pacific Railway at the roundhouse at Northtown at the request of the company. The supply was obtained from a drilled well 618½ feet in depth. The field investigation (W) and analytical results (14254 and 14255 and 14377 and 14378) indicated this to be a safe source to be used for drinking purposes.

On August 6, 1915, an investigation was undertaken on the water supply for the First National-Soo Line building at the request of the management. This supply was obtained from a 670-foot drilled well, located in the west corner of the building. The field investigation (M) showed that satisfactory protection is provided to guard against surface contamination. The analytical data (14359 to 14361) showed that the supply was free from contamination and suitable for public consumption.

On December 21, 1915, an investigation was undertaken on the water supply from a spring at the south end of Soldiers' Home bridge at the request of the United States engineers. The field investigation (W) showed ample opportunity for the pollution of the spring at the point of discharge. The analytical results (14613) showed the water to be of good sanitary quality on the date of this investigation. It was recommended that this spring be abandoned or improved.

On December 21, 1915, an investigation was undertaken on the spring at the mouth of Minnehaha Creek at the request of the United States engineers. The field investigation (W) showed that the spring was not well protected at the point

of discharge, and was subject to pollution during high water periods. The analytical results (14612) showed the water to be of questionable sanitary quality. It was recommended that the spring be abandoned.

On December 21, 1915, an investigation was undertaken on the spring located near the saw mill at the Government Lock and Dam No. 1 at the request of the United States engineers. The field investigation (W) showed that conditions could be improved from a sanitary point of view. The analytical results (14611) showed the water to be of good sanitary quality. It was recommended that the spring be protected at the point of discharge.

ISANTI COUNTY.

Braham—On November 3, 1915, an investigation was undertaken on the water supply of the public school building at the request of the local school board. The supply was obtained from a driven well 8 feet in depth from the basement floor of the building, and 14 feet in depth from the ground surface. The field investigation (W) showed the well to be satisfactory from a sanitary point of view, although its environment could be improved by removing a waste water sink hole. The analytical results (14519) showed the water to be of good sanitary quality. Recommendations were made regarding the changes in environment.

ITASCA COUNTY.

Bennett Mine Location, Near Keewatin—On October 18, 1915, an investigation was made on the public water supply for this location at the request of the health officer. The supply was obtained from an abandoned open pit mine. Data relating to the supply showed that it was still subject to contamination. (M). The analytical results (14501 to 14503) showed the presence of contamination in the supply. Recommendations were made for the installation of the hypochlorite treatment and possibly filtration in order that the supply may be made safe for public consumption.

Bogalusa Location, Section 14, Township 55, Range 24 W—On October 14, 1914, an investigation was undertaken on the Location water supply at the request of the Iron Mining company. The supply was obtained from a 71-foot dug and driven well, which was a property of this company. The field investigation (W) showed the well to be improperly constructed, and the analytical examination (13925) showed suspicious results. It was recommended that the well be reconstructed to afford the necessary protection.

On June 22, 1915, an investigation was undertaken on the Location water supply at the request of the Oliver Iron Mining company. The present field investigation (W) showed conditions which were satisfactory, while in the analytical results (14280) indications of contamination were not found. This supply was recommended for public consumption.

Bulgarian Camp, Section 4, Township 55, Range 24 W—On October 14, 1914, an investigation was undertaken on the water supply at the request of the Oliver Iron Mining company. The supply was obtained from a 19-foot dug well. The field investigation (W) showed that the well was improperly constructed and the analytical results (13926) showed indications of contamination in the water. It was recommended that this well be reconstructed to provide the necessary protection.

On June 22, 1915, an investigation was undertaken on the water supply at the request of the Oliver Iron Mining company. The present field investigation (W) showed conditions which were satisfactory, while in the analytical results (14281) indications of contamination were not found. This supply was recommended for public consumption.

Coleraine—On October 14, 1914, an investigation was undertaken on the public water supply at the request of the Oliver Iron Mining company. The supply was obtained from drifts, sumps and rises in the Canisteo Mine, which is a property of that company. The field investigation (W) showed all sources except that from one of the shafts to be satisfactory from a sanitary point of view. The use of the shaft was immediately discontinued. The analytical results (13912 to 13917) showed the water to be of good sanitary quality. This supply was recommended for public consumption.

On June 22, 1915, an investigation was undertaken on the public water supply at the request of the Oliver Iron Mining company. The field investigation (W) showed conditions which were satisfactory, with a few changes, while in the analytical examination (14283 to 14288) indications of contamination were not found. Following certain minor corrections the water supply was recommended for public consumption.

Concentrator Power Plant (Sec. 9, Twp. 55, R. 24 W.)—On June 22, 1915, an investigation was undertaken on the water supply of this power plant at the request of the Oliver Iron Mining company. This supply was obtained from a dug well 28 feet in depth. The field investigation (W) showed conditions which were satisfactory, while in the analytical results (14279) indications of dangerous contamination were not found. This supply was recommended for public consumption.

Grand Rapids—On September 16, 1915, an investigation was undertaken on the proposed water supply (M) at the request of the health officer. It was found that the local authorities had decided to install a deep well. A test well had previously been drilled to a distance of 544 feet. No samples were taken from this

test well owing to the fact that it had been but recently completed. It was recommended that care be exercised in securing a water tight covering for the well and that the present plans for installing a storage reservoir be carried out, in order to eliminate the necessity for maintaining the lake intake for emergency purposes.

Keewatin—On November 18, 1915, an investigation was made on the public water supply, at the request of the health officer. The supply was obtained from a newly constructed dug well 230 feet in depth. The field data (M) showed an abundant supply of water from this source, and that certain protective measures must be taken to guard the supply from contamination. No samples were collected. Recommendations were made for the disinfection of the shaft after the construction work was completed, and for a water tight covering at the ground surface.

Marble—On October 14, 1914, an investigation was undertaken on the public water supply, at the request of the Oliver Iron Mining Company. The water supply was obtained from a drift in the underground workings of the Hill Mine. The field investigation (W) showed conditions which were satisfactory from a sanitary point of view, and these findings were corroborated by the analytical results (13919 to 13921), which showed the water to be of good sanitary quality. This supply was recommended for public consumption.

On June 22, 1915, an investigation was undertaken on the public water supply, at the request of the Oliver Iron Mining Company. The field investigation (W) and analytical results (14273 to 14275), showed this water supply to be satisfactory for public consumption.

Taconite—On June 22, 1915, an investigation was undertaken on the public water supply, at the request of the Oliver Iron Mining Company. The supply was obtained from a drift in the Holman Mine. The field investigation (W) showed conditions which were satisfactory, while in the analytical results (14276 to 14278), indications of contamination were not found. This supply was recommended for public consumption.

Trout Lake Concentrator Plant—Section 4, Township 55, Range 24 West—On October 14, an investigation was undertaken on the water supply, at the request of the Oliver Iron Mining Company. The supply was obtained from an 80 foot dug well. The field investigation (W) showed that the well had not been completed at the time of the investigation. The analytical results (13924) showed the water to be of good sanitary quality. It was recommended that the well be completed according to the plans contemplated by the local superintendent.

On June 22, an investigation was undertaken on the water supply of the concentrator plant, at the request of the Oliver Iron Mining Company. The present field investigation (W) showed conditions which were satisfactory, while in the analytical results (14282) indications of contamination were not found. The supply was recommended for public consumption.

JACKSON COUNTY.

Heron Lake—On June 26, 1914, an investigation was undertaken on a semi-public water supply on the property of Mr. M. E. Smith in Southbrook Township, at his request. The supply was obtained from a driven well 9 feet in depth. The field investigation (M) showed conditions which were satisfactory, with the exception of a few minor details. The analytical examination (13658 and 13659) showed the water to be of good sanitary quality. Recommendations were made to provide for more suitable drainage away from the well at the surface.

On December 10, 1914, a follow-up investigation was undertaken on this private water supply. The field investigation (M) showed that these recommendations had been complied with and the results were corroborated by the analytical examination (14028 and 14029). The above data show this supply to be suitable for public consumption.

On September 12, 1914, an investigation was undertaken on a test well for a proposed public water supply, at the request of the village recorder. The well was driven to a depth of 8 feet and had been completed two months previous to the time of this visit. The field investigation (M) showed opportunity for pollution to gain access to the supply. This was corroborated by the analytical results (13807 and 13808). Recommendations were made for protecting the proposed location.

On December 11, 1914, an inspection was made of the recent construction on the proposed public water supply. No samples were collected, owing to the fact that the construction work had not progressed far enough to permit the collection of such samples. The field investigation (M) showed that satisfactory protective measures were being supplied to guard the supply from surface contamination.

KANDIYOHI COUNTY.

Whitefield Township—On January 7, 1915, an investigation was undertaken on the water supply at the public school in District No. 57, at the request of the county superintendent. The supply was obtained from a drilled well 232 feet in depth. The field investigation (W) showed certain defects in construction which made

possible the pollution of the source of supply. The analytical results (14071 and 14072) showed the absence of contamination in the water. Recommendations were made regarding the changes in construction necessary to make this a safe source of supply.

KITTSOON COUNTY.

Hallock—On July 29, 1914, an investigation was undertaken on the public water supply, at the request of the village recorder. The field investigation (W) and analytical results (13708 to 13710) showed that the present supply, taken from Two Rivers, was unsatisfactory for public consumption without purification. A temporary hypochlorite plant was recommended, and has since been installed.

On January 15, 1915, a follow-up investigation was undertaken on the water supply to check up the results of a former investigation (C) made October 5-7, 1914, at which time a hypochlorite plant was installed for the treatment of the water supply. This second investigation was occasioned as a result of unsatisfactory analytical results found on samples collected after the plant had been in operation. The field investigation (M) showed that the chemical administering plant was being operated in a satisfactory manner, but showed a decrease in the percentage of available chlorine in a new lot of chemical. The correction was made for the irregularities in treatment. The analytical results (14087 to 14093) showed that the treated water was free from contamination after the corrections were made.

KOOCHICHING COUNTY.

International Falls—On February 26, 1914, a follow-up investigation was undertaken on the public water supply. The supply was obtained from Rainy River and treated with hypochlorite before being distributed to consumers. The field investigation (W) showed that the temporary hypochlorite plant was being operated as satisfactorily as could be expected under the prevailing conditions. There were very sudden changes in the rate of pumpage which made the proper operation of the plant difficult. The analytical results (13442 to 13444) corroborated the field findings. The city was advised to take steps to obtain a more satisfactory water supply.

Northome—On May 4, 1914, an investigation was undertaken on the public water supply, at the request of the executive officer. The supply was obtained from Barrett Lake and distributed without purification. It was recommended (C) that a hypochlorite plant be installed for treating this supply.

LAC QUI PARLE COUNTY.

Boyd—On September 2, 1915, an investigation was undertaken on the public water supply, at the request of the clerk of the school board, District No. 86. The water supply was obtained from a drilled well 62 feet in depth. The field investigation (C) indicated that there was a slight chance for contamination to reach this supply through openings which existed in the curbing and of a receiving reservoir into which the water from the well was discharged. The analytical results (14405 to 14407) indicated the presence of a slight contamination, which was attributed to the fact that the reservoir had been but recently cleaned. Recommendations were offered which would render the supply safe for public consumption.

On December 1, 1915, a follow-up investigation was undertaken on the public water supply. It was found (C) that the recommendations made at the time of the previous investigation had been complied with in a satisfactory manner. The field investigation and analytical results (14546 and 14547) indicated this supply to be safe for public consumption on the date of this investigation.

LAKE COUNTY.

Drummond—On October 15, 1915, an investigation was undertaken on the water supply of the Duluth and Iron Range Railway Company, at their request. The supply was obtained from a 16-foot dug well located in front of the section house. The field data (M) and analytical results (14491) show that conditions relating to the supply were satisfactory.

Highland—On May 21, 1914, an investigation was undertaken on the water supply of the Duluth & Iron Range Railway Company, at their request. The supply was obtained from a dug well 14 feet in depth. The field investigation showed that the location and environment of the well was unsatisfactory. The analytical results (13608) showed indications of contamination in the water. It was recommended that the supply be abandoned or that its depth be increased at least 10 feet and a water tight casing and covering be installed.

On October 14, 1915, a follow-up investigation was undertaken on this water supply. Both field data (M) and analytical results (14481) showed the supply to be suitable for public consumption at this time.

On the same date, an investigation was undertaken on the supply obtained from an 18-20 foot dug well located at the section house. The field data (M) and analytical results (14482) showed that conditions relating to this supply were satisfactory at this time.

An investigation was also undertaken on the supply obtained from a 10-foot dug well located at the rear of the weighmaster's residence. The field data (M) and analytical results (14483) showed this supply to be suitable for public consumption.

Knife River—On October 17, 1914, a follow-up investigation was undertaken on the water supply of the Duluth and Northeastern Railroad, at the request of the company. A previous investigation was made on June 3, 1913, at which time the construction of the well was found to be unsatisfactory and recommendations were made for its improvement. The field investigation (W) and analytical results (13927) showed that the former recommendations had been complied with and that the supply was suitable for public consumption.

Two Harbors—On February 23, 1914, a follow-up investigation was undertaken on the public water supply. The water supply was obtained from Lake Superior and treated with hypochlorite before being delivered to the consumers. The field investigation (W) showed that the temporary hypochlorite plant in use at that time should be supplanted by one of more permanent construction. The analytical results (13432 to 13435) showed the treated water to be of good sanitary quality. It was recommended that the local authorities take immediate steps to install a permanent plant.

On October 16, 1915, an investigation was undertaken on the public water supply for the purpose of noting the operation of the new hypochlorite plant which was installed during June, 1915. The field data (M) showed that this plant was being operated in a very satisfactory manner. A slight reduction in the amount of available chlorine entering the supply was noted, but this was remedied by increasing the quantity of solution flow. The analytical results (14494 to 14498) showed the treated supply to be of excellent sanitary quality.

York—On May 21, 1914, an investigation was undertaken on a water supply of the Duluth & Iron Range Railway Company, at their request. The supply was obtained from a dug well 20 feet in depth. The field investigation (W) showed this well to be unsatisfactory from a standpoint of construction. These findings were corroborated by the analytical results (13609) which showed indications of contamination in the water. Recommendations were made regarding construction work necessary to protect this supply.

On October 15, 1915, an investigation was undertaken on the water supply of the Duluth & Iron Range Railway, at the request of the company. The supply was obtained from a dug well 18 feet in depth, designated as Well No. 1. The field data (M) showed that an excellent protection was provided to guard the supply against contamination. The analytical data (14489) showed the presence of contamination in the water. This was explained as remaining from the time the recent protective construction was installed. Recommendations were made for the disinfection of the well.

On October 15, 1915, an investigation was undertaken on a water supply of the Duluth & Iron Range Railway Company, at their request. The supply was obtained from a 14-foot dug well, designated as Well No. 2. The field data (M) showed that this well was unsatisfactory as a source of supply, owing to defects in construction and improper environment. The analytical data (14490) showed the presence of contamination. Recommendations were made for the abandonment of this well or for its reconstruction, in case it is found desirable to retain it.

LYON COUNTY.

Balaton—On August 19, 1915, an investigation was undertaken on the public water supply, at the request of the clerk of school district No. 46. The water was obtained from a dug well 28 feet in depth. Both the field investigation (C) and the analytical results (14385 to 14387) indicated this water supply to be unsafe for public consumption. Recommendations were offered regarding construction, which, if carried out, would make this water supply reasonably safe from a sanitary point of view.

Marshall—On April 23, 1914, an investigation was undertaken on the public water supply, at the request of a member of the council. The field investigation (C) showed that conditions were not improved over those described in the report of October 7, 1913, which indicated the supply to be unsatisfactory as regarded environment and construction. It was recommended that the entire water works system, exclusive of the distribution mains, be overhauled and that plans for this work be submitted to the State Board of Health for examination before any contracts for work were entered into.

McLEOD COUNTY.

Stewart—On November 4, 1914, an investigation was undertaken on the public water supply, at the request of a citizen. The supply was obtained from a drilled well 318 feet in depth. The field investigation (M) showed avenues through which surface contamination could enter the well on account of improper construction. The analytical results (13959 to 13962) showed the presence of a limited amount of contamination in the water. Recommendations were given concerning the construction necessary to make this a safe supply for public consumption.

On December 6, 1915, a follow-up investigation was undertaken on the public water supply. The field data (M) showed that the supply had been greatly im-

proved since the time of the previous visit. The analytical data (14557 to 14559) showed the absence of contamination in the supply. Recommendations were made for a concrete bottom and curbing in the well pit, the bottom to slope toward a sump in one corner, and also for a pump to remove waste water from the sump.

MARTIN COUNTY.

Triumph—On August 20, 1915, an investigation was undertaken on the public water supply, at the request of the clerk of school district No. 118. The water supply was obtained from a drilled well 116 feet in depth. The field investigation (C) showed this water supply to be open to possible contamination by sewage which might back up into the pump room through a drain connected with the village drainage system. The analytical results (14388 and 14389) showed nothing of special significance in this case, since the water works had been but recently completed. Recommendations were offered for the elimination of the sewer connection to the pump room and to the closing of an opening which existed at the top of the well casing.

MEEKER COUNTY.

Eden Valley—On October 1, 1915, an investigation was undertaken on the public water supply, at the request of the president of the school board. The water was obtained from two drilled wells of the flowing type, 40 and 42 feet in depth. The field investigation (C) showed conditions which were unsatisfactory. The analytical results (14447 to 14450) showed this supply to be of good sanitary quality. Recommendations were offered to improve the construction of the supply.

MILLE LACS COUNTY.

Milaca—On October 29, 1914, an investigation was undertaken on the water supply of the Great Northern Railway Company, at their request. Water was obtained from a private dug well 26 feet in depth. The field investigation (M) showed that the construction and protection of this well were unsatisfactory and these findings were corroborated by the analytical results (13947), which showed the presence of contamination in the supply. Recommendations were made concerning the construction necessary to render this supply safe from a sanitary point of view.

Princeton—On November 13, 1915, an investigation was undertaken on the public water supply, at the request of the school board. This supply was obtained from a drilled well 180 feet in depth. The field investigation (W) showed conditions which were unsatisfactory from a sanitary point of view. The analytical results (14528 to 14530) showed the water direct from the source to be of good sanitary quality, while that in the distribution system showed indications of a limited amount of contamination, the latter being due to recent construction work on the storage tank. Recommendations were made regarding the construction work necessary on the well pit and the disinfection of the tank and distribution system.

MORRISON COUNTY.

Little Falls—On January 19, 1914, an investigation was undertaken on the public water supply, at the request of the Northern Pacific Railway Company. The water was obtained from the Mississippi River and treated with hypochlorite before being distributed for consumption. The field investigation (M) showed that the plant was being operated in a satisfactory manner and the analytical results (13370 to 13374) showed the treated water to be of good sanitary quality. The company in charge of this plant was told to instruct their employees as to the danger which would result if the plant was not carefully operated.

On November 17, 1915, an investigation was undertaken on the public water supply. The field investigation (W) showed that the hypochlorite plant was being operated in a satisfactory manner, and these findings were corroborated by the analytical results (14524 to 14527).

MOWER COUNTY.

Austin—On February 10, 1915, an investigation was undertaken on the water supply for the Chicago, Milwaukee & St. Paul Railway Company, at their request. This supply was obtained from a combined dug and drilled well 271 feet in depth. The field investigation (M) showed the lack of satisfactory protection. Numerous short lengths of pipe, many of them of unknown origin, were found to extend into the well through the brick curbing. The analytical results (14144 and 14145) showed the absence of contamination in the supply. It was recommended that a water tight covering be installed and the abandoned pipes extending through the curbing removed.

On December 21, 1915, a follow-up investigation was made on this water supply. The field survey (M) showed that a water tight curbing and covering had been placed around and over the top of the well. The analytical data (14621 and 14622) showed the absence of contamination in the supply. Recommendations were made for the correction of minor defects in the construction.

Le Roy—On December 21, 1915, an investigation was undertaken on the public water supply, at the request of the clerk of the school board. This supply was obtained from a 426 foot drilled well. The field data (M) showed an unsanitary condition surrounding the well casing at the ground surface. The analytical data (14624 to 14626) showed the absence of contamination in the supply. Recommendations were made for the elimination of the well pit and the elevation of the well casing to a point above the floor of the pumping station.

On December 21, 1915, an investigation was undertaken on the water supply for the public school, at the request of the clerk of the school board. The supply was obtained from a drilled well 75 to 80 feet in depth, located on the school grounds. The field survey (M) showed conditions which were satisfactory. The analytical data (14623) showed the supply to have been free from contamination at this time. Recommendations were made regarding certain changes in the environment of the well.

MURRAY COUNTY.

Currie—On June 21, 1914, an investigation was undertaken on the public water supply, at the request of the Chicago, St. Paul, Minneapolis & Omaha Railway Company. The supply was obtained from a 160 foot drilled well. The field investigation (M) showed that conditions were unsatisfactory. The analytical results (13652 to 13655) showed indications of contamination in the water. Recommendations were offered regarding construction which would be necessary to make this a safe supply.

On September 11, 1914, an investigation was undertaken on the public water supply, at the request of the health officer. The field investigation (M) showed conditions which were a decided improvement over those existing at the time of the previous visit. The analytical results (13803 to 13806) showed no evidence of contamination.

On June 24, 1914, an investigation was undertaken on the water supply of the Chicago, St. Paul, Minneapolis & Omaha Railway Company, at their request. The supply was obtained from an 18 foot dug well. The field investigation (M) showed conditions which were exceedingly unsatisfactory from a sanitary point of view, and the analytical results (13656 and 13657) showed indications of contamination in the water.

NICOLLET COUNTY.

North Mankato—On September 10, 1914, an investigation was undertaken on the public water supply, at the request of the village recorder. Both the field investigation (M) and the analytical results (13789 to 13793) showed this supply to be of excellent sanitary quality.

NOBLES COUNTY.

Bigelow—On September 13, 1914, an investigation was undertaken on the water supply of the Chicago, St. Paul, Minneapolis & Omaha Railway Company, at their request. The field investigation (M) showed avenues through which contamination might reach the supply, and evidences of contamination were found in the analytical examination (13809 and 13810). Recommendations were made for the protection of this water supply.

On December 10, 1914, a follow-up investigation was undertaken on this water supply. The field investigation (M) showed that satisfactory protective measures had been taken to protect this source. The analytical results showed a limited amount of contamination (14021 and 14022), which was attributed to the construction work which had been recently completed.

On August 14, 1915, a follow-up investigation was undertaken on the water supply. The analytical data (M) (14379) on the sample collected from the well at the time of this visit, showed the supply to have been free from contamination and suitable for public consumption.

Ellsworth—On December 9, 1914, an investigation was undertaken on the public water supply, at the request of the village recorder. This examination constituted the second made on this supply. At the time of the former visit, it was found that an unsatisfactory protection had been provided at the surface of the 57-foot dug well from which the supply is derived. The field data (M) showed that these conditions had not been entirely remedied. The analytical data (14016 to 14018) showed indications of a limited amount of contamination. It was recommended that the pump pit be made water tight by placing a lining of concrete around the inside.

On August 13, 1915, a follow-up investigation was made on the public water supply. The various unsanitary features relating to the supply, noted in two previous reports, were pointed out. The field investigation (M) showed that no changes had been made in the system except for the connection with the unsatisfactory Chicago, Rock Island & Pacific Railway supply. This supply will be used for emergency purposes only. Recommendations were again made for construction to protect the supply.

Worthington—On December 10, 1914, an investigation was undertaken on the public water supply, at the request of the village recorder. The supply was being

derived from two drilled and one combined dug and drilled well. The field investigation (M) showed that the protection provided the combined dug and drilled well at the surface was unsatisfactory from a sanitary point of view. The analytical data (14023 to 14027) showed the supply to be of good sanitary quality. It was recommended that a tight covering be built over the top of the combined dug and drilled well in order to protect the supply from surface contamination.

On July 12, 1915, a follow-up investigation was undertaken on the public water supply, to determine if recommendations concerning a more satisfactory protection for the combined dug and drilled well had been complied with. The field investigation (M) showed that these recommendations had been followed out and a suitable covering placed over the well. Coverings were also installed over the two drilled wells, although this was not absolutely necessary from a sanitary point of view. The analytical data (14369 to 14374) showed the water supply from these three wells to be satisfactory for public consumption.

On June 9, 1915, plans were examined (C) for a water supply system for the Southwestern Minnesota Sanatorium, at the request of the engineers. The plans provided for a supply to be pumped from a drilled well into an air pressure tank, from which the water would be supplied to the institution. The plans were recommended for approval.

NORMAN COUNTY.

Ada—On February 23, 1915, an investigation was undertaken on the public water supply, at the request of the health officer. The supply was obtained from four flowing drilled wells, 240 to 253 feet in depth. The field investigation (M) showed defects in the construction of wells No. 1 and No. 3, and also in the underground reservoir. The analytical data (14169 to 14176) showed that no contamination was present in the supply. Recommendations were made for construction which would protect this supply from contamination.

On November 16, 1915, a follow-up investigation was undertaken on the public water supply. It was found (W) that all of the previous recommendations had been complied with.

OLMSTED COUNTY.

Eyota—On April 3, 1914, a follow-up investigation was undertaken on the public water supply, at the request of the health officer. The supply was obtained from a drilled well 203 feet in depth. The field investigation (W) showed ample opportunity for contamination of this supply, and the analytical results (13514-13516) showed indications of contamination in the water. Recommendations were made regarding construction necessary to provide adequate protection for the supply.

On February 9, 1915, a follow-up investigation was undertaken on this supply. The field investigation (M) showed that the recommendations made in the previous report had been partially complied with. The analytical results (14138 to 14141) showed the presence of contamination in the supply. It was recommended that a more satisfactory means be supplied for removing the waste water from the interior of the pump pit.

On April 3, 1914, an investigation was undertaken on the water supply of the Chicago & Northwestern Railroad Company at their request. This supply was obtained from a drilled well 135 feet in depth. The field investigation (W) showed that the recommendations made at the time of the previous investigation, November 14, 1913, had been complied with. The analytical results (13512 and 13513) showed the water to be of good sanitary quality.

Rochester—On May 6, 1914, an investigation was undertaken on the present and a proposed public water supply, at the request of the president of the water company. The supply at that time was obtained from three dug wells each 30 feet in depth. A proposed supply was obtained from a drilled well 418 feet in depth. The field investigation (M) showed both the present and proposed supplies to be satisfactory sources at that time. The analytical results (14554 to 14560) showed the water from both supplies to be of good sanitary quality.

OTTER TAIL COUNTY.

Fergus Falls—On August 1, 1914, an investigation was undertaken on the public water supply, at the request of the health officer. The field investigation (W) and the analytical results (13725 to 13728) showed that the hypochlorite plant was not administering a sufficient amount of chemical to the water. Recommendations for an increase in the amount of chemical were made. It was also recommended that a modern plant of more suitable type be installed at an early date.

On November 19, 1914, an investigation was undertaken on the water supply. This constituted one of the routine investigations on hypochlorite plants authorized by this Board. The field investigation (M) pointed out that the proper amount of hypochlorite was being applied to the water and this was corroborated by the analytical data (13986 to 13992). It was again recommended that a permanent plant of a suitable type be installed, as the plant in operation was of temporary nature and entirely unsatisfactory for continued use.

On November 19, 1914, an investigation was also undertaken, on the source of the public water supply which was obtained by the diversion of the Otter Tail River through Hoot Lake and two reservoirs, at the request of the Water and

Light Commission. The purpose of this investigation was to determine whether or not the Otter Tail Power Company had placed Hoot Lake and the reservoirs in a sanitary condition such as could meet with the approval of the State Board of Health, as prescribed in their contract with the city of Fergus Falls. Certain recommendations had been made previously by this Board. It was found (W) that all but one of these had been complied with. It was further recommended that one farm house and buildings which were still located on the water shed draining directly into Hoot Lake be either removed or provided with drainage which would divert the same in such a direction that it would not reach the lake without proper purification. The analytical results (13980 to 13986), representing water collected at various points from the diversion dam to the city intake, showed that a marked improvement in the sanitary quality of the water took place as it progressed through the system at that season of the year. These results represented conditions when the lake and reservoirs were covered with ice. The fact was pointed out that the results might be entirely changed at other seasons of the year. The point was again made clear that the water from this source would require purification in order to make it safe for public consumption.

On November 19, 1914, an investigation was undertaken on the water supply of the Fergus Ice Cream Company, at the request of the health officer. The supply was obtained from two driven wells, 12 feet in depth. The field investigation (M) showed the source of this supply to be properly constructed, but poor drainage had been established away from these wells. The analytical data (13993) showed indications of a limited amount of contamination in the water. Recommendations were made concerning the necessary drainage.

On February 22, 1915, a follow-up investigation was undertaken on this supply. The field investigation (M) showed that certain minor changes recommended in the previous report had been installed. No further opportunity for contamination of this supply was noticed at the time of this visit. The analytical data (14163) showed that the supply was free from contamination.

On February 22, 1915, an investigation was undertaken on a water supply at the Fergus Marble Works, at the request of the Great Northern Railway Company. The supply was obtained from a bored well 14 feet in depth. The field investigation (M) showed that the top protection against surface contamination was very unsatisfactory. The analytical results (14167) showed the presence of contamination in the supply. Recommendations were made for a water tight covering and curbing, and that the pump be repaired in order to eliminate the necessity for priming it.

On April 27, 1915, while at the Otter Tail County Sanatorium for the purpose of investigating sewage disposal, attention was called to the peculiar taste of the water, by the local employees. A brief inspection (C) indicated that possibly cracks existed in the curbing of the dug well from which the water supply was taken, which would allow roof water containing creosote oil extracted from the shingles to enter the well. It was recommended that the oil curbing be carefully examined for such cracks.

PINE COUNTY.

Sandstone—On February 2, 1915, an investigation was undertaken on the public water supply, at the request of the local health officer. The supply was obtained from a drilled well 732 feet in depth. The field investigation (C) and analytical results (14121 to 14123) indicated this supply to have been safe for public consumption. It was learned that there was considerable difficulty regarding the deterioration and the formation of sediment in the pipes in certain sections of the village. On February 17, a second investigation was made (W) to determine the cause of the trouble. It brought out the fact that this was caused by the action of free carbonic acid in the water. It was suggested that this could be removed by thorough aeration and sedimentation or filtration of the water before it was discharged into the distribution system. The advisability of this was question on account of the excessive cost involved in this treatment. It was suggested that much of the trouble could be overcome by the elimination of dead ends and a systematic flushing of the distribution system.

PIPESTONE COUNTY.

Pipestone—On March 20, 1914, an investigation was undertaken on the water supply of the United States Indian School, at the request of the superintendent. The supply was obtained from three dug wells 22 feet, 20 feet and 20 feet in depth. The field investigation (M) showed that the environment and construction of these wells was unsatisfactory. The analytical results (13503 and 13504) showed the water to be of good sanitary quality. Recommendations were made regarding improvements in the environment and construction.

On December 9, 1915, a follow-up investigation was undertaken on the water supply. The field data (M) showed that an excellent covering had been provided over the three dug wells from which the supply was obtained. The analytical results (14571) showed the supply to be free from contamination.

On December 8, 1915, an investigation was undertaken on the public water supply, at the request of the executive officer. The field data (M) showed that conditions were satisfactory, except that the cover over the manhole in the underground reservoir was not securely protected. The analytical data (14568 to 14570)

showed the supply to have been of good sanitary quality. Recommendations were made that a lock be provided for the opening into the reservoir.

POLK COUNTY.

Crookston—On February 28, 1914, a follow-up investigation was undertaken on the public water supply. The supply was obtained from the Red Lake River, and subjected to sedimentation, filtration and hypochlorite treatment, and also from three drilled wells, 280 feet, 230 feet and 170 feet in depth. The field investigation (W) showed that the plant was being operated in a satisfactory manner. These findings were corroborated by the analytical results (13448 to 13451). It was recommended that a hypochlorite plant of a more permanent type be installed to supplant the temporary device then in use.

On April 2, 1914, an investigation was undertaken for the purpose of advising in regard to the installation of a new type of sterilization apparatus, at the request of the superintendent of the Water Works, Power & Light Company.

On July 30, 1914, a follow-up investigation was undertaken on the water supply. The field investigation (W) showed that the emergency hypochlorite plant still in use was unsatisfactory. A permanent plant of a more modern type was again recommended. The analytical results (13722 to 13724) showed that the water from the three drilled wells was of good sanitary quality.

On May 11, 1915, plans were examined (C) for a water supply at the Polk and Norman Counties Sanatorium, at the request of the consulting engineers. The plans showed a well of the drilled type. A steel pressure tank was to be located in the basement. The plans of the water supply were recommended for approval.

East Grand Forks—On February 28, 1914, a follow-up investigation was undertaken on the public water supply, at the request of the Northern Pacific Railway Company. The supply was obtained from Red Lake River and subjected to filtration and hypochlorite treatment before being delivered for public consumption. The field investigation (W) showed improvements in the equipment and method of operating the plant over those found at the time of the previous investigation, August 13, 1913. The analytical results (13452 to 13457) showed the treated water to be of good sanitary quality. Recommendations were made in regard to replacing of sand in the filters.

Fertile—On October 8, 1914, an investigation was undertaken on the public water supply, at the request of the health officer. The supply was obtained from a drilled well 292 feet in depth. The field investigation (M) showed the protection of the supply to be excellent, but it was found that considerable refuse had been thrown on the surface of the ground adjacent to the underground reservoir. The analytical results (13848 to 13850) showed the water to be of good sanitary quality. The supply was recommended for public consumption, but recommendations were made concerning the removal of the refuse from the area around the reservoir.

RAMSEY COUNTY.

North St. Paul, Silver Lake—On July 13, 1915, an investigation was undertaken on Silver Lake (W) at the request of a local resident. For several years this lake had been infected with a growth of algae which accumulated in the various bays and gave rise to very strong odors. These odors were especially noticeable during the summer months when the organisms reached their maximum growth and began to disintegrate. These odors were so strong that they were extremely annoying to residents on the lake. A microscopic examination of the water showed an excessive growth of Rivularia. It was advised that a systematic treatment of the lake with copper sulphate early in the season would tend to eliminate the development of this vegetable growth.

St. Paul—On February 11, 1914, an investigation was undertaken on the drinking water supply of the Chicago, Burlington & Quincy Railway Company at Dayton's Bluff, at the request of the company. The supply was obtained from a spring. The field investigation (W) showed that this spring was an unsafe source on account of its environment and construction. The analytical data (13428) showed the water to be of good sanitary quality. Recommendations were made concerning the construction work necessary to make this a safe source of supply.

On April 23, 1914, a follow-up investigation was undertaken on this supply. The field investigation (M) showed that the recommendations made in the previous report had been complied with. The analytical results (13540 to 13541) showed the water to be of good sanitary quality.

On February 3, 1915, an investigation was undertaken on the water supply of the Northern Pacific Railway Company at their Mississippi street roundhouse, at the request of the company. The supply was obtained from a flowing drilled well 227 feet in depth. The field investigation (W) showed that conditions were unsatisfactory from a sanitary point of view. The analytical examination (14124 and 14125) did not show indications of contamination. Recommendations were made in regard to construction work necessary to safeguard the supply.

December 16, 1915, a follow-up investigation was undertaken on this water supply. The field investigation (W) showed the supply to be in satisfactory con-

dition. The analytical results (14594 and 14595) showed the water to be of good sanitary quality. The supply was recommended for public consumption.

On September 1, 1915, an investigation was undertaken on the water supply of the Northern Pacific Railway Company at their Fourth street yard office, at the request of the company. Water was obtained from a flowing drilled well 365 feet in depth. The field investigation (W) showed the well to be properly located and constructed. These findings were substantiated by the analytical results (14398) which showed the water to be of good sanitary quality. This water supply was recommended for public consumption.

On February 15, 1915, an investigation was undertaken on the local water supply of the Department of Agriculture of the University of Minnesota, at the request of the chairman of the Sanitary Committee. The supply was obtained from two drilled wells, 270 and 280 feet in depth. The field investigation (W) showed certain minor defects in the protection of one of the wells and the underground storage reservoir, while in the analytical results (14151 to 14165) indications of dangerous contamination were not found. Recommendations were made in regard to certain improvements in construction.

White Bear—On March 11, 1914, a follow-up investigation was undertaken on the water supply of the Northern Pacific Railway Company. The supply was obtained from a drilled well 700 feet in depth. The field investigation (M) showed that extensive improvements had been made on the supply since the previous investigation, but that there was still opportunity for contamination. The analytical results (13484 and 13485) showed indications of contamination in the water. Recommendations were made regarding the construction work necessary to correct the defects in the supply.

On June 18, 1914, a follow-up investigation was undertaken on this supply. The field investigation (M) again showed the same unsatisfactory conditions found at the time of the previous investigation. The analytical results (13640 and 13641) showed indications of contamination in the water. The recommendations made in the previous report were again offered.

On October 30, 1914, a follow-up investigation was undertaken on this water supply. The field investigation at this time (M) showed that recent construction had amply protected the supply, but the analytical results (13955 to 13957) showed the presence of a limited amount of contamination in the water, which was attributed to the construction work. It was recommended that further samples be taken so that this supply could be certified.

On November 24, 1914, a follow-up investigation was undertaken on this water supply. This investigation was made for the purpose of again collecting samples to see if the contamination had been eliminated. The field data (M) and analytical results (13996 to 13998) at this time showed this to be a suitable source of water supply to use for public consumption.

On February 24, 1915, a follow-up investigation was undertaken on this supply, at the request of the executive officer. The supply was obtained from a drilled well 350 feet in depth. The field data (M) showed an unsanitary condition in the well pit, due to the presence of much waste water. There was also a lack of protection for the county well, which was used as an emergency supply. The analytical data (14453 to 14456) showed the present village supply to be free from contamination. They also showed the presence of contamination in the emergency supply. Recommendations were made for the improvement of conditions around the well and for protective construction for the county well.

RED LAKE COUNTY.

Red Lake Falls—On July 30, 1914, an investigation was undertaken on the public water supply, at the request of the executive officer. The supply was obtained from a combined dug and drilled well, 52 and 209 feet deep, respectively. The field investigation (M) showed that the construction recommended in the previous report had been installed. The analytical data (14177 to 14179) showed the presence of a limited amount of contamination in the water. Further recommendations for the protection of the well pit were made, and instructions were given for removing the contamination thought to have gained access at the time of construction by the addition of hypochlorite.

On February 24, 1915, a follow-up investigation was undertaken on this supply. The field investigation (M) showed that the construction recommended in the previous report had been installed. The analytical data (14177 to 14179) showed that the supply was free from contamination at this time. Recommendations were made for placing flanged covers over the two collared openings in the floor of the pump pit, and local authorities expressed their willingness to comply with this request immediately.

REDWOOD COUNTY.

Lamberton—On August 18, 1915, an investigation was undertaken on the public water supply, at the request of the clerk of the school board of district No. 31. The water supply was obtained from a drilled well 65 feet in depth. Both the field investigation (C) and the analytical results (14380 to 14382) showed this water to be unsafe for public consumption. Recommendations were offered which, if carried out, would make this water supply safe from a sanitary point of view.

On October 26, 1915, a follow-up investigation was undertaken on the public water supply. It was found at this time that only one of the recommendations made in the previous report had been carried out. The analytical results (14509 to 14511) indicated the presence of contamination in the supply. Both field (C) and analytical results indicated the water to be unsafe for public consumption, and it was recommended that steps be taken immediately to comply with the recommendations offered previously.

Sanborn—On January 29, 1914, an investigation was undertaken on the water supply of the Chicago & Northwestern Railway Company, at their request. The supply was obtained from a 360 foot drilled well. The field investigation (M) showed that the well was improperly constructed from a sanitary point of view. These findings were corroborated by the analytical results (13408). Recommendations were made regarding new construction work which would be necessary to make this a safe source of supply.

Walnut Grove—On September 1, 1915, an investigation was undertaken on the public water supply, at the request of the school board of district No. 23. The water supply was obtained from two drilled wells, each 304 feet in depth. The field investigation (C) showed the remote possibility for water from this well to be contaminated by sewage which might back up into the well pit through a drain connected with the village drainage system. The analytical results (14403 and 14404) indicated the presence of a slight amount of contamination in the water supply. This was probably due to the recent construction work. Recommendations were offered for the elimination of the sewer connection to the well pit.

RENVILLE COUNTY.

Morton—On January 28, 1915, an investigation was undertaken on the public water supply, at the request of the local health officer. The supply was obtained from a spring. The field investigation (W) brought out the fact that the spring was improperly constructed and protected. The analytical data (14116 to 14119) showed the water to be of good sanitary quality, but slightly objectionable from an aesthetic point of view. It was recommended that the supply be relocated and properly constructed to exclude any possibility of contamination.

RICE COUNTY.

Faribault—On April 10, 1914, an investigation was undertaken on the water supply for the School for Feeble Minded, at the request of the executive officer. The supply was obtained from a drilled well 746 feet in depth. The field investigation showed conditions which were satisfactory (W) and these findings were corroborated by the analytical results (13529) which showed the water to be of good sanitary quality.

On April 10, 1914, an investigation was undertaken on the public water supply, at the request of the executive officer. The supply was obtained from two dug wells, each 20 feet in depth, and three drilled wells, 1,056, 800 and 1,160 feet in depth. The field investigation (W) showed that conditions were similar to those found at the time of the previous investigation, February 15, 1913. The analytical results (13524 to 13528) showed the water to be of good sanitary quality. It was recommended that the suggestions offered in the previous report be carried out.

On February 10, 1915, an investigation was undertaken on the water supply for the Chicago, Milwaukee & St. Paul Railway Company, at their request. The supply was obtained from a 47 foot dug well. The field investigation (M) showed that an unsatisfactory protection had been provided to guard against the entrance of waste surface materials. The analytical results (14146 and 14147) showed the absence of contamination in the supply. Recommendations were made for improvements on the well pit and for better protection at the ground surface.

On September 2, 1915, a follow-up investigation was undertaken on this water supply. The field investigation (M) showed that extensive repairs had been made on the well following the recommendations of the previous report of this division. The protection provided in the lower part of the well pit, however, was found to be unsatisfactory. The analytical data (14408 and 14409) showed the presence of contamination in the supply. Recommendations were made for construction which would prevent waste water from draining into the well. It was also recommended that the covering for the well be kept locked and that openings in the elevated wooden reservoir tank be closed.

Northfield—On July 17, 1914, a follow-up investigation was undertaken on the public water supply. The supply was obtained from a 360 foot drilled well. The field investigation (W) showed that the recommendations made in the previous report had been complied with and the analytical data (13677 to 13679) showed the water to be of good sanitary quality. Further recommendations for safeguarding the supply were made.

ROCK COUNTY.

Beaver Creek—On June 26, 1914, an investigation was undertaken on the water supply at the public school building, at the request of the principal of schools. The supply was obtained from a 160 foot drilled well. The field investigation (M) showed this supply to be satisfactory from a sanitary point of view. These findings

were corroborated by the analytical results (13662 and 13663), which showed the water to be of good sanitary quality.

On the same date, an investigation was undertaken on the public well, at the request of the principal of schools. The supply was obtained from a combined dug and drilled well 73 feet in depth. The field investigation (M) showed conditions which were not satisfactory. These features related to the improper construction at the surface. The analytical results (13660 and 13661) showed indications of contamination in the water. Recommendations were made to provide adequate protection to this supply.

On December 9, 1914, a follow-up investigation was undertaken on the public water supply. The field investigation (M) showed that the previous recommendations had been complied with and the supply had been given ample protection. These findings were corroborated by the analytical results (14019 and 14020). The results of this investigation indicate the water supply to be a suitable source for public consumption.

On August 12, 1915, an inspection was made of this well to determine if a minor recommendation made at the time of the previous investigation had been carried out. It was found (M) that the proper protection had been provided.

Luverne—On July 2, 1914, an investigation was undertaken on the public water supply, at the request of the local health officer. The supply was obtained from two dug wells 19 feet in depth. Both the field investigation (W) and the analytical results (13665 to 13668) showed the water to be unsatisfactory for domestic purposes.

On the same date, an investigation was undertaken on two proposed sources for a new water supply. These sources consisted of a spring and the collection of water from a watershed. It was suggested that before either of these was further considered that the installation of deep drilled wells be thoroughly investigated.

On August 13, 1915, an investigation was undertaken on a newly constructed well intended as a future source of public supply. This well was a drilled well 273 feet in depth. It was completed in April, 1915, and had flowed steadily since that time. Large quantities of sand had been present in the supply since the time of its completion. The field investigation (M) showed that satisfactory protection had been provided to guard against contamination. The analytical data (14375 and 14376) showed that the supply was free from contamination. It was recommended that a screen be installed on the bottom of the well casing as a means of eliminating sand.

ROSEAU COUNTY.

Warroad—On December 17, 1915, an investigation was undertaken on the public and certain community water supplies, at the request of the governor. The purpose of this investigation was to determine what effect the maintenance of proposed regulated levels in the Lake of the Woods would have on these supplies. Both field data (C) and analytical results (14607 and 14610) indicated that the public water supply, obtained from the Warroad River, was unsatisfactory for public consumption. Three typical community wells were examined, two of the deep drilled type and one of the bored type. The field investigation showed that one of the drilled wells and the bored well were in a fairly satisfactory condition. The analytical results (14606 and 14607) corroborated these findings. The other drilled well was found to be in an unsatisfactory condition at the surface. The analytical results (14609) indicated that a slight amount of contamination was entering the well. It was the opinion of this division that the maintenance of the proposed regulated levels in the Lake of the Woods would have no effect on the sanitary quality of the water from these sources.

ST. LOUIS COUNTY.

Allen Junction—On May 20, 1914, an investigation was undertaken on the water supply of the Duluth & Iron Range Railway Company, at the request of the company. The supply was obtained from a dug well 20 feet in depth. The field investigation (W) showed conditions which were generally satisfactory, except that better drainage should be provided away from the well at the surface. The analytical results (13597) showed the water to be of good sanitary quality. Recommendations were offered to provide better drainage.

On October 13, 1915, a follow-up investigation was undertaken on this water supply. The field data (M) and analytical results (14470) showed that conditions relating to this supply were satisfactory.

On the same date, an investigation was undertaken on the supply of this company located at the section house. The water was obtained from a 24-foot dug well. The field data (M) and analytical results (14471) showed the supply to be satisfactory for public consumption.

Alpena Location—Section 5, Township 58, Range 17 West—On October 7, 1914, an investigation was undertaken on the location water supply, at the request of the Oliver Iron Mining Company. The supply was obtained from two separate locations at the Alpena Mine, namely, drifts and sumps in shafts No. 1 and No. 2. The field investigation showed conditions which were satisfactory from a sanitary point of view (W) and the analytical results (13852 to 13857) showed the water to be of good sanitary quality. The supply was recommended for public consumption.

On June 26, 1915, an investigation was undertaken on the water supply of this location, at the request of the Oliver Iron Mining Company. The present field investigation (W) showed conditions which were satisfactory. The analytical results (14321 to 14324) indicated the water to be of good sanitary quality. This supply was recommended for public consumption.

Aurora—On May 21, 1914, an investigation was undertaken on the water supply of the Duluth & Iron Range Railway Company, at their request. The supply was obtained from a 32-foot dug well. The field investigation (W) showed conditions which were satisfactory, while the analytical examination (13602) showed the water to be of good sanitary quality.

On July 17, 1914, an investigation was undertaken on a proposed public water supply to be obtained from Whitewater Lake, at the request of the health officer. The field data (M) showed that the supply was open to contamination. The analytical data (13687 to 13695) showed a limited amount of pollution in the water. The supply could not be recommended for public consumption without purification.

Bangor Mine Location, near Biwabik—On October 19, 1914, an investigation was undertaken on the water supply for this location, a property of the Pickands-Mather Company, at the request of the general superintendent. The supply was taken from a sump in the lower workings of the Bangor Mine. The field data (M) showed that excellent protection had been provided for this source of supply. The analytical results (14504 to 14506) showed the supply to have been free from contamination and suitable for public consumption at that time.

Belgrade Mine Location, near Biwabik—On October 19, 1914, an investigation was undertaken on the water supply for this location, a property of the Pickands-Mather Company, at the request of the general superintendent. The water was obtained from a sump in the lower workings of the Belgrade Mine. The field data (M) showed that satisfactory protection was provided to guard the supply against contamination. The analytical results (14507 and 14508) showed this supply to be of good sanitary quality.

Biwabik—On May 21, 1914, an investigation was undertaken on the water supply of the Duluth & Iron Range Railway Co., at their request. The supply was obtained from a drilled well 312 feet in depth. The field investigation (W) showed this supply to be unsatisfactory. These findings were corroborated by the analytical results (13600).

On November 19, 1915, an investigation was undertaken on the public water supply, at the request of the health officer. The supply was obtained from a 173-foot dug well. The field data (M) showed that extensive construction work was being done on the well and that the clear water supply had recently been flooded. The analytical data (14536 to 14538) showed the presence of a limited amount of contamination in the supply, no doubt due to the flooding of the clear water drift. Recommendations were made for the isolation of the emergency underground pump room and for a water tight covering over the well at the ground surface. The source of supply then in use was found to be satisfactory provided extreme care was exercised to prevent flooding.

Breda—On May 21, 1914, an investigation was undertaken on the water supply of the Duluth & Iron Range Railway Company, at their request. The supply was obtained from an 18-foot dug well. The field investigation (W) showed conditions which were satisfactory and these findings were corroborated by the analytical results (13606), which showed the water to be of good sanitary quality.

On October 14, 1915, an investigation was undertaken on the water supply. The field data (M) and analytical results (14478) showed that conditions relating to this supply were satisfactory at this time.

Brimson—On May 21, 1914, an investigation was undertaken on the water supply of the Duluth & Iron Range Railway Company, at their request. The supply was obtained from a dug well 14 feet in depth. The field investigation (W) showed conditions which were satisfactory. These findings were corroborated by the analytical results (13607), which showed the water to be of good sanitary quality. Minor suggestions were offered to provide better drainage for the waste water from the pump.

On October 14, 1915, an investigation was undertaken on the supply from a dug well 14 feet in depth located opposite the depot. The field data (M) and analytical results (14480) showed that conditions relating to this supply were satisfactory at this time.

On the same date, an investigation was undertaken on the water supply located at the section foreman's residence, which is obtained from an 18-foot dug well. The field data (M) and analytical results (14479) showed that conditions relating to this supply were satisfactory.

Chisholm—On January 9, 1914, an investigation was undertaken on the public water supply, at the request of the superintendent of the water works. The supply was obtained from drifts in the Monroe Mine and subjected to sedimentation, filtration and hypochlorite treatment before being distributed for public consumption. The field investigation (M) showed the plant to be operated in a satisfactory manner and this finding was corroborated by the analytical results (13361 to 13366), which showed the filtered water to be of good sanitary quality.

On September 2, 1914, plans for concrete work on the addition to the filter plant, prepared by the Pittsburgh Filter Company, were examined (C). Changes in the slopes shown for the floor of the sedimentation chambers were recommended. Otherwise the plans were approved.

On October 11, 1914, an investigation was undertaken on the public water supply, at the request of the Oliver Iron Mining Company. The field investigation (W) showed the source of supply to be satisfactory from a sanitary point of view, the purification necessary being used only as an extra precaution in case of accidental contamination. The analytical results (13880 and 13890 to 13894) showed the water to be of good sanitary quality both at the source and after passing through the purification plant. These results, representing conditions on the date of this investigation show the water supply to be suitable for public consumption.

Colby—On May 21, 1914, an investigation was undertaken on the water supply of the Duluth & Iron Range Railway Company, at their request. The supply was obtained from a dug well 18 feet in depth. The field investigation (W) showed conditions which were satisfactory, while in the analytical results (13603) indications of dangerous contamination were not found, although a high bacterial count was present. It was recommended that the cover of this well be removed and an investigation made to determine possible sources of this contamination.

On October 13, 1915, an investigation was undertaken on the water supply. The field data (M) and analytical results (14472) showed that conditions relating to the supply were satisfactory at this time.

Cook—On January 18, 1915, an investigation was undertaken on a semi-public water supply, at the request of the health officer. The supply was obtained from a spring. The field investigation (M) showed an unsatisfactory covering over the reservoir. It also showed that extreme care must be exercised during flood periods to exclude river water from the interior of the spring reservoir. The analytical results (14102 and 14103) showed an absence of contamination. It was recommended that a concrete covering be placed over the spring reservoir and that great care be taken in closing the outlet pipes when the supply from the river threatens to enter.

On October 13, 1915, a follow-up investigation was made on this spring. Certain recommendations made in the report on the previous investigation of January 18 were found to have been complied with. The field investigation (C) showed that the supply was still open to possible contamination from water which might enter from Little Fork River. Recommendations were made to close overflow pipes used to discharge surplus water from the spring into the river. The analytical results (14465 and 14466) indicated the absence of contamination in the supply.

Deacon Location—Section 13, Township 58, Range 18 West—On June 26, 1915, an investigation was undertaken on the water supply of this location, at the request of the Oliver Iron Mining Company. This supply was obtained from a drift in the Deacon Mine. The field investigation (W) showed conditions which were satisfactory, while in the analytical results (14326 and 14325) indications of dangerous contamination were not found. This supply was recommended for public consumption.

Duluth—On October 17, 1914, a follow-up investigation was undertaken on the public water supply. The supply was obtained from Lake Superior and subjected to hypochlorite treatment. The field investigation (W) showed that the plant was being properly operated and this finding was substantiated by the daily analytical results (except Sunday) made by the Duluth Branch Laboratory. Examinations on the public water supply have been made in the Branch Laboratory throughout this entire biennial period.

Duncan Location—Section 27, Township 58, Range 20 West—On June 24, an investigation was undertaken on the water supply at this location, at the request of the Oliver Iron Mining Company. The supply was obtained from a drift in the Duncan Mine. The field investigation (W) showed conditions which were satisfactory, while in the analytical results (14306 and 14307) indications of dangerous contamination were not found. This water supply was recommended for public consumption.

Elba Mine—On May 12, 1914, an investigation was undertaken on the water supply at this location, at the request of the general superintendent. The supply was obtained from the underground workings of the Elba Mine, a property of the Pickands-Mather Company. The field investigation (M) showed that the supply was not adequately protected. The analytical results (13589 to 13591) showed the water to be of good sanitary quality. It was recommended that the proposed construction work be carried out and that particular pains be taken to isolate the drift from which the water was obtained.

On December 22, 1914, a follow-up investigation was undertaken on the location water supply. The field investigation (W) showed conditions which were satisfactory from a sanitary point of view, and the analytical results (14060 and 14061) showed the water to be of good sanitary quality.

On September 14, 1915, an investigation was undertaken on the water supply for this location, at the request of the superintendent. The field investigation (M) showed that an unsatisfactory protection was being provided for the sump from which the supply was obtained. A new sump was being constructed in order to

increase the quantity of the supply. The analytical results (14419 and 14420) showed the supply to be free from contamination. Recommendations were made for tight partitions to separate each of these sumps from the main drift of the mine.

Ely—On January 7, 1914, an investigation was undertaken on a water supply at the Mizera residence, located on the outskirts of Ely, at the request of the health officer. The field investigation (M) showed that this family had obtained water for drinking purposes from Shagawa Lake and also from a dug well. The analytical results (13359 and 13360) showed the water from both sources to be unsatisfactory for drinking purposes.

On January 7, 1914, an investigation was undertaken on the public water supply, at the request of the health officer. The supply was obtained from Shagawa Lake and purified by means of sedimentation, filtration and hypochlorite treatment. The field investigation (M) showed that the plant was being operated in a satisfactory manner and these observations were substantiated by the analytical results (13353 to 13358), which showed the treated water to be of good sanitary quality.

On February 25, 1914, a follow-up investigation was undertaken on this supply. The field investigation (W) showed that the water purification plant was being operated in a satisfactory manner. The analytical data (13436 to 13440) showed the treated water to be of good sanitary quality.

On April 8, 1914, a follow-up investigation was undertaken on the supply. The field investigation (M) showed that the water purification plant was being operated in a satisfactory manner and these findings were corroborated by the analytical results (13530 to 13534).

On May 12, 1914, a follow-up investigation was undertaken on this supply. The field investigation (M) showed that the purification plant was being operated in a satisfactory manner. The analytical results (13574 to 13580) showed the treated water to be of good sanitary quality. Minor suggestions were offered regarding the operation of the plant.

On July 18, 1914, an investigation was undertaken on the water supply, at the request of the health officer. The field investigation (M) showed that the purification plant was being operated in a satisfactory manner on the date of this visit. The analytical results (13696 to 13699) showed the treated water at the plant to be of good sanitary quality, but indications of contamination were found in the water on the distribution system. Recommendations were made concerning the operation of the plant.

On October 16, 1914, a follow-up investigation was undertaken on the public water supply. The field investigation (W) and analytical results (13929 to 13934) indicated that there were certain defects in the operation of the plant and that the rules laid down for its operation were apparently not being complied with.

On July 29, 1915, an investigation was undertaken on the public water supply, at the request of the health officer. Previous to this time, considerable complaint had been made regarding this water, owing to the presence of an odor. The field investigation (M) showed that the outlet from Shagawa Lake had been closed by the lumber companies during the spring season. This action may have caused the odor in the public supply due to stagnation of the lake supply or the distribution of sewage through it. The hypochlorite plant was found to be working in a satisfactory manner except for a decrease in the amount of available chlorine due to an inferior grade of chemical in use at that time. The analytical results (14349 to 14354) showed the treated supply to have been free from contamination and suitable for public consumption at that time.

On September 13, 1915, plans were examined (C) for a new sedimentation basin to be constructed at the water filtration plant. These plans showed coagulating and sedimentation basins capable of treating water at the rate of considerably more than 2,000,000 gallons per day. With certain reservations, the plans were recommended for approval.

On June 27, 1915, an investigation was undertaken on the water supply of Sandy Point, a picnic ground, at the request of the Oliver Iron Mining Company. The water supply was obtained from a driven well 18 feet in depth. The field investigation (W) showed conditions which were unsatisfactory, while the analytical results (14333) showed the water to be of good sanitary quality. It was recommended that improvements be made on the pump in order to put the water supply in a safe condition.

Embarrass—On May 20, 1914, an investigation was undertaken on the water supply of the Duluth & Iron Range Railway Company, at their request. The supply was obtained from a dug well 9 feet in depth. The field investigation (W) showed this source to be satisfactory from a sanitary point of view. The analytical results (13596) showed the water to be of good sanitary quality.

On October 13, 1915, a follow-up investigation was undertaken on the water supply. The field data (M) and analytical results (14469) showed the supply to be satisfactory.

Eveleth—On October 8, 1914, an investigation was undertaken on the public water supply, at the request of the Oliver Iron Mining Company. The supply was obtained from St. Mary's Lake and distributed to the consumers without purification. St. Mary's Lake has a comparatively small watershed and is con-

stantly policed by the local authorities. The field investigation (W) brought out the fact that at the time of the construction of the new pumping station a ditch had been installed which drained the area around the pumping station and the employees' residences and discharged into St. Mary's Lake near the water supply intake. The analytical results (13871 to 13874) showed the water supply to be of good sanitary quality. Recommendations were made to remedy the discharge of water from the ditch into St. Mary's Lake.

Fairbanks—On May 21, 1914, an investigation was undertaken on the water supply of the Duluth & Iron Range Railway Company, at their request. The supply was obtained from a 26-foot dug well. The field investigation (W) showed that the drainage facilities for carrying surface water away from the well were inadequate. The analytical results (13605) showed the presence of a limited amount of contamination in the supply. Recommendations were made to provide adequate drainage on the area adjacent to the well.

On October 14, 1915, a follow-up investigation was undertaken on the water supply of the Duluth & Iron Range Railway Company. Both the field data (M) and the analytical results (14477) showed this supply to be satisfactory for public consumption.

French River—On May 22, 1914, an investigation was undertaken on the water supply of the Duluth and Iron Range Railroad Company, at their request. The supply was obtained from a dug well 28 feet in depth. The field investigation (W) showed that the surface construction of this well was unsatisfactory. The analytical results (13612) showed the water to be of good sanitary quality. It was recommended that a water tight covering be installed and that adequate drainage for waste water be provided.

On October 15, 1915, a follow-up investigation was undertaken on the water supply of the Duluth & Iron Range Railway Company. The field data (M) showed conditions which were satisfactory. The analytical results (14493) showed the presence of contamination in this supply, which probably was contributed during the time the recent construction work was installed. Recommendations were made for the disinfection of the well.

Genoa Location—Section 34, Township 58, Range 17 West—On October 8, 1914, an investigation was undertaken on the location water supply, at the request of the Oliver Iron Mining Company. The supply was obtained from a drift in the underground workings of the Genoa Mine, a property of this company. The field investigation (W) showed conditions which were satisfactory from a sanitary point of view. The analytical results (13868 to 13870) showed the water to be of good sanitary quality. This supply was recommended for public consumption.

On June 25, 1915, an investigation was undertaken on the water supply of this location, at the request of the Oliver Iron Mining Company. The field investigation (W) showed conditions which were satisfactory, while in the analytical results (14312 to 14314) indications of dangerous contamination were found. The source of the contamination was caused by the flooding of the mine a short time previous to the investigation. The source of supply was disinfected with calcium hypochlorite, and following this the water was recommended for public consumption.

Gilbert—Ely or Cedar Island Lake—On October 8, 1914, an investigation was undertaken on Ely or Cedar Island Lake, at the request of the Oliver Iron Mining Company. This lake has been the subject of several investigations by this Board as a source of public water supply and the data collected have brought out the fact that it was absolutely unsafe for public consumption without purification (W). The analytical results (13866 and 13867) showed the water on this particular date to be of good sanitary quality, but there was no indication of the water remaining in this condition, as it is an open body of water and subject to contamination at any time. Recommendations were made concerning the purification necessary if this source was to be used as a public water supply.

On January 14, 1915, an investigation was undertaken (C) in regard to the location of the proposed water filtration plant. The supply from the Genoa Mine would not be available for any great length of time, so it was proposed to take water from Ely or Cedar Island Lake and filter it by means of a mechanical sand filter, followed by chemical treatment before pumping it into the distribution system. Advice was given regarding the proposed location of the intake. A proposed by-pass for fire protection was advised against. Disinfection of the filtered water was recommended.

On March 23, 1915, plans were examined for the water purification plant (C), at the request of the consulting engineer. The plans showed a plant of the rapid sand type with a total capacity of 750,000 gallons per 24 hours. The equipment was to be modern. The plant was to be located on the shore of Ely Lake. The plans were recommended for approval.

Glen Location—Section 29, Township 58, Range 20 West—On October 10, 1914, an investigation was undertaken on the location supply, at the request of the Oliver Iron Mining Company. The supply was obtained from a drift in the underground workings of the Glen Mine, a property of this company. The field investigation (W) showed conditions which were satisfactory from a sanitary point of view. The analytical results (13883 to 13885) showed the water to be of good sanitary quality. These results indicated the water to be suitable for public consumption.

On June 24, 1915, an investigation was undertaken on the water supply of this location, at the request of the Oliver Iron Mining Company. The field investigation (W) showed conditions which were satisfactory, while in the analytical examination (14303 to 14305) indications of dangerous contamination were not found. This supply was recommended for public consumption.

Graham Location—Section 20, Township 59, Range 14 West—On June 27, 1915, an inspection manhole and cover be provided for determining the height of the request of the Oliver Iron Mining Company. The supply was obtained from drifts in the Graham Mine. The field investigation (W) showed conditions which were unsatisfactory, while in the analytical examination (14340 to 14343) indications of dangerous contamination were not found. Recommendations were made for the improvement of this supply.

Hartley Location—Section 23, Township 58, Range 20 West—On October 10, 1914, an investigation was undertaken on the location water supply, at the request of the Oliver Iron Mining Company. The supply was obtained from a shaft and drift in the Hartley Mine, a property of this company. The field investigation (W) showed that the source was improperly constructed from a sanitary point of view and the analytical results (13889 and 13890) showed indications of a limited amount of contamination in the water. Recommendations were made concerning the construction that would be necessary to protect the source.

On June 24, 1915, an investigation was undertaken on the supply at this location, at the request of the Oliver Iron Mining Company. The field investigation (W) showed conditions which were satisfactory, while in the analytical results (14298 and 14299) indications of contamination were not found. This supply was recommended for public consumption.

Hibbing—On July 16, 1914, an investigation was undertaken on the water supply from the Penobscot Mine, at the request of the Water and Light Commission. The field investigation (M) and the analytical results (13684 to 13686) showed that the water could be recommended for public consumption.

On the same date, an investigation was undertaken on the supply from the Scranton Mine, at the request of the Water and Light Commission. The field investigation (M) showed that the supply from this source was unsatisfactory for public consumption. The analytical findings (13682 and 13683) showed indications of contamination.

On October 13, 1914, an investigation was undertaken on the public water supply, at the request of the Oliver Iron Mining Company. The supply was obtained from three sources, two shafts at the village pumping station, a shaft and drifts at the Penobscot Mine and from the underground workings of the Scranton Mine, the two latter sources being used as an auxiliary supply. The field investigation (W) showed the Penobscot Mine to be a safe source, while the shafts at the pumping station and the Scranton Mine were unsafe from a sanitary point of view. The above findings were substantiated by the analytical results (13899 to 13901). It was recommended that the temporary hypochlorite plant be installed at the Scranton Mine.

On October 14, 1914, an investigation was undertaken on a proposed water supply, at the request of the Water, Light, Power and Building Commission. The village expected to drill a number of wells in a district several miles south of the village. Considerable exploration work had been completed and a number of test wells sunk in the area selected. An analytical examination (13905) was made of one of the test wells, but the results were considered faulty on account of the fact that it was a recent installation and the well had not been pumped for a sufficient length of time to discharge a water on which judgment could be passed. In the field investigation (W) the proposition of obtaining water from the district selected was looked upon with favor.

On December 22, 1914, an investigation was undertaken on the progress work of the proposed water supply, at the request of the Layne & Bowler Company. This company requested an examination of water from test well No. 8, which had been pumped for a considerable length of time. The field investigation (W) showed that exploration work had progressed since the investigation of October 13, as well as the construction work on water mains. It was found that test well No. 8 was improperly protected from a sanitary point of view. The analytical results (14055 and 14056) showed the presence of a limited amount of contamination, which probably gained entrance directly from the surface on account of poor protection. The results could not be used as an index of the sanitary quality of the water from this source. Attention of the local authorities was called to certain aesthetic and commercial characteristics of the water obtained from this source. The local authorities were cautioned against placing too strict interpretation on the results obtained from these small test wells, as they would probably not compare exactly with results from larger installations in the same locality.

On January 12-16, 1915, a portable hypochlorite plant for disinfecting the water supply at the Scranton Mine was installed, at the request of the secretary of the Water, Light, Power and Building Commission. This installation (C & M) was found necessary following two previous inspections on the sanitary quality of this supply. Following treatment, the analytical results (14095 to 14100) showed the water to be of good sanitary quality.

On March 31-April 1, 1915, an investigation was undertaken on wells No. 1 and No. 2 of the proposed new supply, and also on a spring near this location. This was done at the request of the Layne & Bowler Company, who were installing this supply. The wells are 68 and 121 feet in depth, respectively. The field data (M) showed the general plan to be very satisfactory, but owing to lack of protection at the surface it was possible for contamination to enter the supply. The analytical results (14210 to 14214) showed the presence of contamination in the supply. Recommendations were made for a more satisfactory covering for the wells at the surface.

On May 24, 1915, an investigation was made on well No. 1 of the proposed new supply, at the request of the Layne & Bowler Company. The field investigation (M) showed that a satisfactory temporary protection had been provided to eliminate surface contamination from the interior of the well. This protection was provided merely as a means of determining the true sanitary quality of the supply, and does not represent permanent construction. The analytical results (14236 and 14237) showed the absence of indications of contamination in the supply.

On May 26, 1915, an inspection was made at the Scranton Mine in order to regulate the amount of chemical solution being applied to the water following a change in the system of pumping, at the request of the Water, Light, Power and Building Commission. The village required an increased amount of water at this time and larger pumps were installed to obtain this increase. Owing to the presence of an odor, the amount of chemical was slightly reduced. The field investigation (M) showed that conditions relating to the Scranton Mine supply were the same as at the time of previous visits. The analytical results (14238 to 14241) showed the absence of contamination in both the raw and treated water.

Hopper—On September 15, 1915, an inspection of the water supply of the Duluth, Winnipeg & Pacific Railway Company was made, at the request of the superintendent. This supply was obtained from a drilled well 60 feet in depth. The field investigation (M) showed that an unsatisfactory protection was being provided the well at the surface. Open places in the iron pump might also allow contamination to enter the supply. The analytical results (14422) showed the supply to be free from contamination at this time. Recommendations were made for construction to protect the supply.

Hull Rust Yards—On June 2, 1914, a follow-up investigation was undertaken on the water supply of the Duluth, Mesaba & Northern Railroad. The supply was obtained from a dug well 92 feet in depth. The field investigation (M) showed that improvements would be necessary in order to make this a safe supply for drinking purposes. The analytical results (13624 and 13625) showed the water to be of good sanitary quality. It was recommended that the plank platform supporting the pump be repaired so as to eliminate the possibility of any foreign material reaching this supply.

On September 13, 1915, a follow-up investigation was made on this water supply. The field investigation (M) showed that a water tight covering had been laid in the bottom of the well pit, thus insuring the elimination of waste water from the water supply. The analytical data (14414 and 14415) showed that the supply was free from contamination at that time.

Kinney—On April 9, 1914, an investigation was undertaken on the public water supply, at the request of a committee of citizens. The supply was obtained from the underground workings of the Cavour Mine. The field investigation (M) showed conditions which were generally satisfactory from a sanitary point of view, and these findings were corroborated by the analytical results (13537 and 13538).

On December 22, 1914, a follow-up investigation was undertaken on the public water supply. The field investigation (W) showed that the recommendations made in the previous visit had been complied with. The analytical results (14057 to 14059) showed the water to be of good sanitary quality. The above results showed this water supply to be suitable for public consumption.

On December 22, 1914, an investigation was undertaken on a proposed public water supply. At this time it appeared that the Cavour Mine was soon to be closed and the supply from that source abandoned. Several plans had been suggested for a new source. The village authorities were considering installing a drilled well and connecting such a supply with water from the Kinney Mine. This plan was advised against, as the water from the Kinney Mine was unsatisfactory from a sanitary point of view.

On February 1, 1915, an investigation was made on the proposed water supply (C) at the request of the village council. It was proposed to construct a well from which the water would be pumped into a concrete storage tank. Plans for this system were carefully considered and recommended for approval.

On July 30, 1915, an investigation was undertaken on the public water supply, at the request of the health officer. The supply was obtained from a 187 foot dug well constructed about four months previous to that time. Much trouble had been experienced from the presence of a disagreeable odor in the supply. The field investigation (M) showed that good protection was provided at the top of the well. The analytical data (14355 to 14358) showed a limited amount of contamination in the supply direct from the well and also in the distribution system. This was interpreted as being the remains of that contributed during the time of construction. It was explained that the disagreeable odor might have its origin from

organic materials extracted from the wood timbers with which the shaft is curbed. Recommendations were made regarding protective construction work and also for the improvement of the sanitary conditions of the area directly surrounding the well and reservoir. Instructions were given for cleaning and sterilizing the two storage reservoirs and distribution system with calcium hypochlorite.

On November 18, 1915, an investigation was undertaken on the public water supply, at the request of the health officer. The field investigation (M) showed that the previous recommendations for a better protection for this supply had not been complied with. It also showed the presence of the disagreeable physical contents found previously in this supply. The analytical data (14531 to 14533) showed that no contamination was present in the supply. Recommendations were made for the installation of the protective features mentioned in the previous report. It was also suggested that a process of aeration and filtration be installed in order to remove the objectionable physical contents.

Leonidas Location—Section 36, Township 58, Range 18 West—On October 5, 1914, an investigation was undertaken on the location water supply, at the request of the Oliver Iron Mining Company. The supply was obtained from a small drift and sump in the underground workings of the Leonidas Mine, a property of this company. The field investigation (W) showed conditions which were satisfactory from a sanitary point of view, while in the analytical results (13875 to 13877), indications of contamination were not found. Certain suggestions were made to the company regarding the extra precaution necessary to protect this supply.

On June 25, 1915, an investigation was undertaken on the water supply of this location, at the request of the Oliver Iron Mining Company. The field investigation (W) showed conditions which were satisfactory. The analytical results (14315 to 14317) indicated the water to be of good sanitary quality. This supply was recommended for public consumption.

McKinley—On June 5, 1914, an investigation was undertaken on the public water supply, at the request of the Duluth & Iron Range Railway Company. The supply was obtained from four points driven 27 feet into the sand stratum at the bottom of a 29-foot dug well. The field investigation (M) showed opportunity for the pollution of this well by waste water of surface origin. The analytical results (13632 to 13636) showed indications of a limited amount of contamination in the water. Recommendations were made regarding the construction necessary to protect this well from pollution.

Mariska—On May 21, 1914, an investigation was undertaken on the water supply of the Duluth & Iron Range Railway, at the request of the company. The supply was obtained from a dug well 39 feet in depth. The field investigation showed the well to be in an exceedingly unsatisfactory condition owing to improper construction. The analytical results (13599) showed indications of a limited amount of contamination in the water. Recommendations were offered regarding the construction work necessary to protect the supply.

On October 13, 1915, a follow-up investigation was undertaken on this water supply. The field data (M) showed conditions which were unsatisfactory, owing to the presence of a vent pipe which was inserted through the top covering. The analytical data (14474) showed the presence of contamination in this supply. Recommendations were made for the removal of the vent pipe and the closing of the opening through the platform, and also for the disinfection of the well.

Meadow Mine—On June 4, 1914, an investigation was undertaken on a water supply of the Inter State Iron Company, at the request of the local health officer. The water was obtained from a drift in the underground workings of the Meadow Mine. The field investigation (M) showed opportunity for contamination of the supply at its source. The analytical results (13616 and 13617) showed the water to be of good sanitary quality. Recommendations were made which would provide adequate protection by isolating the drift from which the supply was obtained.

On September 14, 1915, a follow-up investigation was undertaken on this water supply. The field investigation (M) showed that the protection provided this supply was still unsatisfactory. Recommendations were again made for the complete isolation of the clear water supply, in order that unauthorized persons might not have access to it. The analytical data (14417 and 14418) showed the supply to be free from contamination.

On November 19, 1915, another follow-up investigation was undertaken on this water supply. The field investigation (M) showed that a tight plank partition had been provided and that the supply was completely separated from the other workings. The analytical data (14534) showed the supply to be suitable for public consumption.

Miller Mine—On June 4, 1914, an investigation was undertaken on a water supply of the Pitt Iron Mining Company, at the request of the local health officer. The supply was obtained from a sump in the underground workings of this mine. The field investigation (M) showed that there was opportunity for foreign material to enter the clear water sump. The analytical results (13620 and 13621) showed indications of contamination in the water. It was recommended that the supply be abandoned.

Mitchell—On June 2, 1914, an investigation was undertaken on the water supply of the Duluth, Mesaba & Northern Railway, at the request of the company. The water was obtained from a combined dug (30-foot) and drilled (45-foot) well. The

field investigation (M) showed conditions which were satisfactory from a sanitary point of view, while the analytical examination (13622 and 13623) showed the water to be of good sanitary quality.

Mohawk Mine—On June 4, 1914, an investigation was undertaken on this water supply, owned by the Pickands-Mather Company, at the request of the local health officer. The water was obtained from a sump in the underground workings of the Mohawk Mine. The field investigation (M) showed that the sump was improperly protected against drainage from the mine. The analytical results (13618 and 13619) showed the water to be of good sanitary quality. Recommendations were made to provide better drainage.

On November 19, 1915, a follow-up investigation was undertaken on this water supply. The mine had shut down for a considerable period of time, during which it was allowed to become flooded. The field investigation (M) showed that certain protective construction was necessary to guard this supply against contamination. The analytical data (14535) showed the presence of contamination in the supply. Recommendations were made for the construction of a concrete dam across the opening to the clear water sump.

Monroe Location—Section 28, Township 58, Range 20 West—On October 10, 1914, an investigation was undertaken on the location water supply, at the request of the Oliver Iron Mining Company. The supply was obtained from drifts in the Monroe Mine, a property of this company. The field investigation (W) showed conditions which were satisfactory from a sanitary point of view, and the analytical results (13880 and 13882) showed the water to be of good sanitary quality. These results indicated this to be a suitable source for public consumption.

On June 24, 1915, an investigation was undertaken on the water supply at this location, at the request of the Oliver Iron Mining Company. The field investigation (W) showed conditions which were satisfactory, while in the analytical examination (14308 to 14311) indications of dangerous contamination were not found. This supply was recommended for public consumption.

Morris Location—Section 31, Township 58, Range 20 West—On October 12, 1914, an investigation was undertaken on the location water supply, at the request of the Oliver Iron Mining Company. The supply was obtained from a shaft 182 feet in depth. The field investigation (W) showed that there was opportunity for contamination of this supply by drainage from one of the adjoining drifts. This observation was corroborated by the analytical results (13902 to 13904), which showed the presence of contamination in the water. Recommendations were made concerning the construction which would be necessary to protect this supply.

On June 23, 1915, an investigation was undertaken on the water supply of this location, at the request of the Oliver Iron Mining Company. The supply was obtained from a shaft and drifts in the Morris Mine. The field investigation (W) showed conditions which were satisfactory. The analytical examination (14295 to 14297) indicated the water to be of good sanitary quality. This supply was recommended for public consumption.

Mountain Iron—On June 3, 1914, a follow-up investigation was undertaken on the public water supply, which was obtained from a shaft and drift. The field investigation (M) showed that the recommendations of the previous report had been complied with and that conditions were satisfactory from a sanitary point of view. The analytical results (13626 to 13629) showed the water to be of good sanitary quality.

Myers Location—Section 22, Township 58, Range 20 West—On October 10, 1914, an investigation was undertaken on the location water supply, at the request of the Oliver Iron Mining Company. The supply was obtained from a drift and sump in the Myers Mine, a property of this company. The field investigation (W) showed the supply to be unsatisfactory from a sanitary point of view. This was due to the fact that it had just recently been installed and was not completed. The final installation as planned should amply protect this supply. The analytical results (13886 to 13888) showed the presence of contamination in the water. Recommendations were made concerning the carrying out of the plans suggested by the local superintendent.

On June 24, 1915, an investigation was undertaken on the water supply at this location, at the request of the Oliver Iron Mining Company. The present field investigation (W) showed conditions which were satisfactory, while in the analytical results (14300 to 14302) indications of dangerous contamination were not found. This supply was recommended for public consumption.

Norman and Shaw Locations—Section 9, Township 58, Range 17 West—On October 7, 1914, an investigation was undertaken on the water supply furnishing these two locations, at the request of the Oliver Iron Mining Company. The supply was obtained from a drift and sump in the Norman Mine and distributed from this point to the locations. The source and locations are properties of the Oliver Iron Mining Company. The field investigations showed conditions which were unsatisfactory from a sanitary point of view (W), and it was found to be possible for employees to come in contact with the water at its source. The analytical results (13858 to 13861) showed the water to be of good sanitary quality. Recommendations were made concerning the protection necessary to prevent employees coming in contact with the water.

On June 25, 1915, an investigation was undertaken on the water supply of this location, at the request of the Oliver Iron Mining Company. The field investigation (W) showed conditions which were satisfactory, while in the analytical results (14318 to 14320) indications of dangerous contamination were not found. The supply was recommended for public consumption.

Nopeming Sanatorium—On November 10, 1915, an investigation was undertaken on the water supply of this institution, at the request of the superintendent. The water was obtained from two drilled wells 208½ and 298 feet in depth. The field investigation (W) showed certain defects in construction, especially regarding the old drilled well. The analytical results (14520 to 14523) corroborated the field data. Recommendations were made regarding the construction work which would be necessary to make these wells safe sources of supply.

Palmers—On May 22, 1914, an investigation was undertaken on the water supply of the Duluth & Iron Range Railway Company, at the request of the company. The supply was obtained from a 48-foot dug well. The field investigation (W) showed that certain features of construction were unsatisfactory. This applied especially to vent pipes for ventilating the well and provision for carrying away the surface water. The analytical examination (13611) showed indications of contamination in the water. Recommendations were made to remove the ventilating shafts and to provide proper drainage from the well, also that a thorough interior examination of the well be made.

On October 15, 1915, an investigation was undertaken on the water supply of the Duluth & Iron Range Railway Company. The field data (M) and analytical results (14492) showed that conditions relating to this supply were satisfactory.

Penobscot Location—Section 21, Township 57, Range 21 West—On October 12, 1914, an investigation was undertaken on the location supply, at the request of the Oliver Iron Mining Company. The supply was obtained from a shaft and drifts in the Penobscot Mine. The field investigation (W) and analytical results (13899 to 13901) showed this water supply to be suitable for public consumption.

On June 23, 1915, an investigation was undertaken on the water supply at this location, at the request of the Oliver Iron Mining Company. The field investigation (W) showed conditions which were satisfactory. The analytical results (14293 to 14294) indicated the water to be of good sanitary quality. This supply was recommended for public consumption.

Rainy Junction—On June 3, 1914, a follow-up investigation was undertaken on the water supply of the Duluth, Mesaba & Northern Railway. The supply was obtained from a drilled well 45 feet in depth. The field investigation (M) showed conditions which were satisfactory from a sanitary point of view and the analytical results (13630 and 13631) showed the absence of indications of contamination in the water. Minor suggestions were made concerning the removal of water from the pump.

Robinson—On May 20, 1914, an investigation was undertaken on the water supply of the Duluth & Iron Range Railway Company, at the request of the company. The supply was obtained from a dug well 12 feet in depth. The field investigation (W) showed conditions which were unsatisfactory from a sanitary point of view, and these findings were corroborated by the analytical results (13594). Recommendations were made regarding the construction which would be necessary to adequately protect this supply.

On October 13, 1915, an investigation was undertaken on the water supply of the Duluth & Iron Range Railway, at the request of the company. This supply was obtained from a 16-foot dug well. The field data (M) showed sanitary conditions surrounding this supply to be satisfactory. The analytical data (14467) showed the presence of contamination. This was interpreted as remaining from the time of construction. Recommendations were made for the disinfection of the well.

Sheridan (Harold) Location—Section 3, Township 57, Range 21 West—On October 12, 1914, an investigation was undertaken on the location water supply, at the request of the Oliver Iron Mining Company. The supply was obtained from a 42-foot dug well. The field investigation (W) showed that the construction of the well was not perfect and that opportunity was afforded for contamination to reach the supply. The analytical results (13898) showed the water to be of good sanitary quality. It was recommended that the well be provided with the necessary protection to exclude the possibility of material gaining access to it.

On June 23, 1915, an investigation was undertaken on the water supply at this location, at the request of the Oliver Iron Mining Company. The field investigation (W) showed conditions which were satisfactory. The analytical results (14290 and 14291) indicated the water to be of good sanitary quality. This supply was recommended for public consumption.

Shiras Location—Section 16, Township 58, Range 19 West—On June 26, 1915, an investigation was undertaken on the water supply of this location, at the request of the Oliver Iron Mining Company. This supply was obtained from a drift and sump in the Shiras Mine. The field investigation (W) showed conditions which were satisfactory, while in the analytical results (14329 and 14330) indications of dangerous contamination were not found. The supply was recommended for public consumption.

Sibley Location—Section 26, Township 63, Range 12 West—On February 25, 1914, an investigation was undertaken on the proposed water supply, at the request of the Oliver Iron Mining Company. The field investigation (W) showed that there were two possible sources of supply, (a) water from Shagawa Lake after chemical treatment; (b) a well. The company was advised to obtain water from a well, if possible. The analytical results (13411) collected at this point on Shagawa Lake, showed the water to contain a limited amount of contamination and to be unfit for drinking purposes without purification.

On June 27, 1915, an investigation was undertaken on the water supply, at the request of the Oliver Iron Mining Company. This supply was obtained from a dug well 17 feet in depth. The field investigation (W) showed conditions which were satisfactory, while in the analytical results (14331 and 14332) indications of contamination were found. This contamination undoubtedly reached the supply during the time of its construction and little sanitary significance was placed upon its presence. It was recommended that the supply be disinfected with calcium hypochlorite and following this it could be used for public consumption.

Skibo—On May 21, 1914, an investigation was undertaken on the supply of the Duluth & Iron Range Railway Company, at the request of the company. The supply was obtained from a dug well 13 feet in depth. The field investigation (W) showed that the construction of this well was faulty, while the analytical results (13604) showed a limited amount of contamination in the water. Recommendations were made regarding the construction necessary in order to adequately protect this supply.

On October 14, 1915, an investigation was undertaken on this water supply. The field data (M) and analytical results (14476) showed that conditions relating to the supply were satisfactory.

Soudan Location—Section 27, Township 61, Range 15 West—On June 27, 1915, an investigation was undertaken on the water supply of this location, at the request of the Oliver Iron Mining Company. The water supply was obtained from six dug wells ranging in depth from 20 to 67 feet. The field investigation (W) showed conditions which were satisfactory, while in the analytical results (14343) indications of a limited amount of contamination were demonstrated in certain of these wells. The wells had been constructed a short time before this and the presence of contamination was attributed to the construction work. It was recommended that the wells be disinfected with calcium hypochlorite and following this they would be suitable for public consumption.

Sparta—On May 21, 1914, an investigation was undertaken on the water supply of the Duluth & Iron Range Railway Company, at their request. The supply was obtained from a dug well 25½ feet in depth. The field investigation (W) showed this well was improperly constructed. The analytical examination (13598) showed the water to be of questionable sanitary quality. Recommendations were made regarding the construction which would be necessary to safeguard this supply.

On October 14, 1915, an investigation was undertaken on this water supply. The field data (M) showed conditions which were satisfactory. The analytical data (14475) showed the presence of contamination in the supply. Recommendations were made for the disinfection of the well.

Stevens Mine Location—On June 4, 1914, an investigation was undertaken on this water supply, which is a property of the Oliver Iron Mining Company, at the request of the local health officer. The supply was obtained from a driven well located at the bottom of the shaft in the Stevens Mine. The field investigation (M) showed conditions which were unsatisfactory, while the analytical results (13615) showed the water to be of good sanitary quality. A recommendation was offered to provide covering for the shaft which would eliminate the possibility of future contamination.

On June 27, 1915, an investigation was undertaken on the water supply at this location, at the request of the Oliver Iron Mining Company. The field investigation (W) showed conditions which were satisfactory, while in the analytical results (14344 and 14345) indications of dangerous contamination were not found. This supply was recommended for public consumption.

Summit—On May 21, 1914, an investigation was undertaken on the water supply of the Duluth & Iron Range Railway Company, at their request. The supply was obtained from a dug well 43 feet in depth. The field investigation (W) showed conditions which were apparently satisfactory from a sanitary point of view, while in the analytical examination (13601) indications of contamination were found. It was recommended that the cover be removed from this well and a thorough investigation made to determine any possible sources of pollution.

On October 13, 1915, an investigation was undertaken on this water supply. The field data (M) and analytical results (14473) showed the supply to be suitable for public consumption.

Tower Junction—On May 20, 1914, an investigation was undertaken on the water supply of the Duluth & Iron Range Railway Company at their request. The supply was obtained from a 6-foot dug well. The field investigation (W) showed that the safety of the supply was questionable, on account of the well being shallow. The analytical results (13595) showed the water to be of good sanitary quality. It was recommended that a well of greater depth be provided.

On October 13, 1915, an investigation was undertaken on the water supply of the Duluth & Iron Range Railway Company, at their request. This supply was obtained from an 18-foot dug well, just installed. The field data (M) showed that conditions were satisfactory. The analytical data (14468) showed the presence of contamination, which was explained as remaining from the time of construction of the well. Recommendations were made for disinfection.

Troy Location—Northeast quarter northeast quarter, Section 7, Township 57, Range 17 West—On September 15, 1915, an investigation was undertaken on the public water supply for this location, at the request of the Pickands-Mather Iron Mining Company. This supply was obtained from a dug well 65 feet in depth. The field investigation (M) showed that contamination was reaching this supply. Recommendations were made for a water tight covering at the ground surface.

Virginia—On October 7, 1914, an investigation was undertaken on the public water supply, at the request of the Oliver Iron Mining Company. The supply was obtained from three drilled wells, 415, 741 and 721 feet in depth respectively. The field investigation (W) showed conditions which were satisfactory from a sanitary point of view. It was found that a new 1,000,000 gallon concrete reservoir was being installed near the pumping station. The analytical results (13862 to 13865) showed the water to be of good sanitary quality.

Wanless Location—Section 16, Township 58, Range 19 West—On June 26, 1915, an investigation was undertaken on the water supply of this location, at the request of the Oliver Iron Mining Company. This supply was obtained from a drift and sump in the Wanless Mine. The field investigation (W) showed conditions which were satisfactory, while in the analytical results (14327 and 14328) indications of contamination were not found. This supply was recommended for public consumption.

Winton—On May 14, 1914, an investigation was undertaken on the water supply for the lumber company locations, at the request of the local health officer. The field investigation (M) showed that the hypochlorite treatment which had been installed previously at two different sources of supply was not producing satisfactory results on the treated water. The analytical results (13581 to 13584) showed the presence of contamination in both supplies.

On July 18, 1914, an investigation was undertaken on this supply, at the request of the health officer. The field investigation (M) showed that an insufficient amount of chemical was being applied in the hypochlorite plant at the St. Croix Pumping Station. The treatment of the Swallow-Hopkins supply had not been started. The installation of wells at these locations was suggested.

SHERBURNE COUNTY.

Big Lake—On January 21, 1914, an investigation was undertaken on the water supply at the public school building, at the request of the principal of schools. The supply was obtained from a driven well 18 feet in depth. The field investigation (M) showed this supply to be in good sanitary condition and these findings were substantiated by the analytical results (13375). A suggestion was offered regarding a method of more efficiently caring for the waste water from the pump.

STEARNS COUNTY.

Melrose—On February 22, 1915, an investigation was undertaken on the water supply of the Great Northern Railway Company, at their request. The supply was obtained from a 21-foot dug and driven well. The field investigation (M) showed that unsatisfactory protection was provided at the top of the dug portion. The analytical data (14166) showed the absence of any contamination in the supply. It was recommended that a concrete curbing and covering be built around and over the well at the surface in order to eliminate waste water from the dug portion of the well.

On August 20, 1915, a follow-up investigation was undertaken on this water supply. It was found (W) that part of the recommendations made at the time of the previous investigation had been complied with. Certain suggestions were offered to the general superintendent's office. On September 1, notification was received that these suggestions had been complied with, thus making the supply safe for public consumption. The analytical data (14391) showed the water to be of good sanitary quality. This supply was recommended for public consumption.

St. Cloud—On January 19, 1914, an investigation was undertaken on the water supply at the Union School, at the request of the superintendent of schools. The supply was obtained from a drilled well 68 feet in depth. The field investigation (M) showed conditions which were satisfactory, and these findings were corroborated by the analytical data (13369), which showed the water to be of good sanitary quality.

On March 3, 1914, a follow-up investigation was undertaken on the public water supply. The supply was obtained from the Mississippi River and subsequently treated with hypochlorite. The field investigation (W) showed that certain changes had been made in the pumping equipment, which necessitated a change in the

quantity of hypochlorite administered, and this had not been done. The necessary changes in chemical were immediately made. The analytical results (13470 to 13472) showed the treated water to be of good sanitary quality. Instructions were given concerning an increase in the amount of chemical to accommodate the changes in the pumping equipment.

On October 28, 1914, an investigation was undertaken on a private well at the Grand Central Hotel, at the request of the manager. The supply was obtained from a 70-foot drilled well. The field results (M) showed that this well was properly protected, while the analytical results (13948 to 13950) showed a limited amount of contamination. It was assumed that the contamination found in the water had reached the source at the time of its installation and the pumping since that time had not been sufficient to remove it. Certain recommendations were made which would add further to the protection of the area immediately around the well.

Sauk Center—On October 28, 1914, an investigation was undertaken on the public water supply, at the request of the city attorney. The supply was obtained from the Sauk River and distributed for public consumption without purification. The field data (W) showed the Sauk River to be an unsafe source from which to obtain a public water supply and these findings were corroborated by the analytical results, which showed the presence of contamination in the supply (13951 to 13954). Recommendations were made concerning the purification of the water from this source, if its use was to be continued, and also regarding pumping equipment.

On October 28, 1914, an investigation was undertaken on a proposed water supply, at the request of the city attorney. The local authorities proposed sinking a dug well immediately on the shore of the Sauk River adjacent to the present pumping station, which would make it possible to use the present pumping equipment. The field investigation (W) brought out the fact that the location selected was dangerous from a sanitary point of view and another location was recommended. Certain advice was given concerning the character of underground waters in this section. It was left optional with the local authorities whether they purify the supply from Sauk River or follow out the plan of installing an underground supply. It was suggested that the latter plan was probably the most feasible and economical.

STEELE COUNTY

Owatonna—On September 9, 1914, an investigation was undertaken on the public water supply, at the request of the executive officer. The supply was obtained from a spring. The field data (M) and the analytical results (13786 and 13787) indicated this source to be unsuitable for a drinking water supply. Recommendations were made for the protection of the supply.

SWIFT COUNTY

Benson—On August 12, 1914, an investigation was undertaken on the public water supply, at the request of the executive officer. Investigations by the division of preventable diseases brought out the fact that an epidemic of typhoid fever had occurred in Benson, which was apparently water borne. A temporary hypochlorite plant was installed and put into operation on August 12. The field investigation (C) revealed the probable source of contamination. It was possible to determine that the pollution occurred on July 17, from sewage backing up and standing in the pump pit to a depth of from one foot to fifteen inches. The sewage had entered the suction pipe leading to well No. 2, through a defective flange connection. The analytical results (13733 to 13740, 13743 to 13747 and 13774 to 13785) corroborated these evidences of pollution and later showed that the contamination had been effectually removed by the application of hypochlorite. Recommendations for changes in the pump and piping system in order to prevent future contamination were made.

On November 23, 1914, an investigation was undertaken on the public water supply, at the request of the city clerk. The field investigation (C) showed that four of the eight recommendations made in the previous report had been complied with, and that two others had been partly followed out. The analytical results on samples collected from the wells and distribution system (13999 to 14004) showed the absence of contamination. It was suggested that all of the former recommendations be complied with.

On December 23, 1914, an investigation was made, to determine whether or not the recommendations made previously had been complied with, at the request of the city clerk. It was found (C) that these recommendations had been carried out in a satisfactory manner. The analytical data (14062 to 14066) indicated the absence of contamination.

On September 23, 1915, an investigation was undertaken on the public water supply, at the request of the health officer. Both the field examination (C) and the analytical results (14443 to 14446) indicated this water supply to be of good sanitary quality.

TODD COUNTY

Long Prairie—On June 2, 1915, an investigation was undertaken on the public water supply and on a proposed new supply. The supply was obtained from a drilled well 180 feet in depth. Considerable objection to the supply then in use had arisen from the presence of an odor and precipitate which formed after the water had been drawn. The field investigation (M) showed that there was need of certain construction work in the well pit in order that it might be made water-tight. The odor and appearance of the water suggested the presence of a high iron content. Samples obtained from the well near the proposed location for a new supply showed no improvement. The analytical results (14242 to 14245) showed the absence of contamination in the supply. Recommendations for protective construction work in the well pit and information concerning the proposed new supply and the supply from Lake Charlotte were contained in the report.

Staples—On March 2, 1914, a follow-up investigation was undertaken on the public water supply. The supply was obtained from a combined dug and drilled well, 75 feet in depth. The field investigation (W) showed that conditions had been somewhat improved over those found at the time of the previous investigation, but that they were still unsatisfactory. The analytical examination (13473 to 13476) showed slight indications of contamination in the mixed water from the dug and drilled well. The water obtained direct from the drilled well was of good sanitary quality. Recommendations were made to the effect that the supply be confined to that obtained from the drilled well, that the storage capacity for water be increased and that the emergency connection with the water supply of the Northern Pacific Railway Company be discontinued.

On February 27, 1915, a follow-up investigation was undertaken on this water supply. The field investigation (M) showed conditions similar to those found at the time of the previous investigation. The recommendations contained in the report of that date had not been carried out. The analytical data (14186 to 14190) showed the presence of a limited amount of contamination in the distribution system. It was recommended that the instructions contained in the former report be carried out at once.

TRAVERSE COUNTY

Browns Valley—On December 3, 1914, an investigation was undertaken on the public water supply, at the request of the Great Northern Railway Company. The supply was obtained from four dug wells, 10 and 12 feet in depth. It was recommended at the time of the previous investigation that the use of one of these wells be discontinued. The field investigation (M) showed that this well had been temporarily discontinued but again put into operation. It was also found that the protection of the other three wells was not entirely satisfactory and certain defects were noted in the equipment at the pumping station which might lead to the contamination of the water. The analytical results (14008 to 14011) showed the presence of a limited amount of contamination in the water. Recommendations were made for the improvement of the supply.

WABASHA COUNTY.

Hammond—On November 12, 1914, an investigation was undertaken on the public water supply, at the request of the village clerk. The supply was obtained from a drilled well 225 feet in depth, while an auxiliary supply used for fire protection was taken from a combined dug and driven well 12 feet in depth. The field investigation (M) showed the source to be improperly constructed from a sanitary point of view and also showed a defect in the distribution system at a point where the water main passed under the river from one portion of the town to the other. The analytical results (13973 to 13978) showed the supply from the drilled well to be of good sanitary quality. Recommendations were made to remedy the defects in construction. It was further recommended that the use of the driven and dug well for auxiliary purposes be discontinued and an adequate underground supply be provided.

Lake City—On December 20, 1915, an investigation was undertaken on the water supply of the Chicago, Milwaukee & St. Paul Railway Company, at their request. The supply was obtained from a dug well. The field data (M) showed numerous avenues through which contamination might reach the supply. The analytical data (14515 and 14516) showed the presence of contamination. Recommendations were made for the removal of various pipes which enter the well through the curbing, the installation of a water tight covering in the well below the pump and over it at the ground surface and for the repairing and cleaning of the reservoir tank.

Wabasha—On February 9, 1915, an investigation was undertaken on the water supply for the Chicago, Milwaukee & St. Paul Railway Company, at their request. This supply was obtained from two dug wells, 50 and 65 feet in depth. The field investigation (M) showed that unsatisfactory protection was provided for these wells to guard against the entrance of surface contamination. The analytical data (14136 and 14137) showed indications of contamination in the supply. It was recommended that a water tight curbing and covering be installed to exclude all traces of surface waste materials from the water supply in the well pit. It was also recommended that water tight protection be built around the wells at the surface.

WASHINGTON COUNTY

Mahtomedi—On March 11, 1914, an investigation was undertaken on the water supply of the public school building in School District No. 69, at the request of the clerk. The supply was obtained from a drilled well 130 feet in depth. The field investigation (M) showed faulty environment and construction. The analytical results (13482 and 13483) showed the water to be of good sanitary quality. Recommendations were made concerning construction necessary to protect the supply. It was also recommended that improvements be made on the school privy.

St. Croix River—On March 5, 1915, an investigation was undertaken to determine the sanitary quality of the water in the river at a point near the foot of Lake St. Croix, at the request of the executive officer. The field investigation (W), which was confined exclusively to a point adjacent to where the samples were collected, i.e., Prescott, Wisconsin, showed conditions which were satisfactory. Data collected from information already on file showed that sewage pollution was being contributed from Hudson and Stillwater. The analytical results (14192 to 14194) showed the presence of contamination in the water. It was assumed that this contamination originated from the sewage discharged into the river at Hudson and Stillwater.

South Stillwater—On December 16, 1915, an investigation was undertaken on the public water supply, at the request of the health officer. The supply was obtained from a drilled well 684 feet in depth. The field investigation (W) showed conditions which were satisfactory so far as the source and storage of the supply was concerned. It was found that the distribution system was connected with a supply obtained from St. Croix Lake, which is polluted. The analytical results (14592 and 14593) showed the water to be of good sanitary quality. A recommendation was made to abandon the connection with Lake St. Croix or to make changes in construction which would make such a connection less dangerous.

WATONWAN COUNTY

St. James—On January 27, 1914, an investigation was undertaken on the public water supply, at the request of the city clerk. The supply was obtained from two drilled wells, 540 feet in depth. This supply had been previously investigated and found to be unsatisfactory from the standpoint of construction. Recommendations had been offered. At the time of this visit, it was found (M) that only a portion of them had been complied with. This applied to well No. 1. The analytical results (13381 to 13383) showed the water from both sources to be of good sanitary quality.

On the same date, an investigation was undertaken on the water supply located on the property of W. S. Manning, at the request of the Chicago, St. Paul, Minneapolis & Omaha Railway Company. The supply was obtained from a drilled well 30 feet in depth. The analytical results (13391) showed the water to be unsatisfactory for drinking purposes.

WILKIN COUNTY

Breckenridge—On March 2, 1914, an investigation was undertaken on the public water supply, at the request of the city clerk. The supply was obtained from the Otter Tail River and purified by sedimentation, filtration and hypochlorite treatment. The field investigation (W) showed that this plant was being operated in a satisfactory manner and these findings were corroborated by the analytical results (13458 to 13461).

On June 3, 1915, an investigation was undertaken on the public water supply, at the request of the local officials. The field investigation (M) showed that an insufficient amount of calcium hypochlorite was being applied at that time. The analytical results (14247 to 14251) showed indications of contamination as evidenced by an excessively high count on the samples obtained on the distribution system. Recommendations were made for increasing the amount of chemical entering the supply.

Campbell—On June 12, 1914, an investigation was made on the public water supply, at the request of the village clerk. It was recommended (C) that a new source of supply be obtained and that new pumping apparatus and storage tanks be installed. A deep drilled well was advised as the source of supply.

On June 10, 1915, plans were examined (C) for a water supply and distribution system, at the request of the consulting engineer. The water was to be pumped from a drilled well by the air lift system and delivered into a concrete reservoir located on the surface of the ground. From this reservoir, the water will be pumped into a distribution system and into an air pressure tank. The plans were recommended for approval.

WINONA COUNTY

Altura—On September 1, 1915, an investigation of the public water supply was undertaken, at the request of a citizen. The supply was obtained from a drilled well, 300 feet in depth. The field investigation (M) showed that an underground brick and stone relay reservoir was in very poor sanitary condition and subject to contamination. This reservoir served no purpose as the supply could be run directly to the satisfactory concrete reservoir without this intermediate

storage. The analytical results (14410 to 14413) showed the supply to be free from indications of contamination at this time. Recommendations were made for the disconnection of the relay reservoir and also for a tight connection to be made between the pump spout and the pipe leading the supply away. Further recommendations were made for regular flushing of the three dead ends to insure a fresh supply at these points.

Elba—On September 22, 1915, an investigation was undertaken on the public water supply, at the request of the village recorder. The supply was obtained from a driven well 19 feet in depth. The field investigation (W) showed that it would be necessary to fill up the pit surrounding the well at this surface and establish drainage away from it in all directions in order to make this a safe source of water supply. The analytical results (14334) showed the water to be of good sanitary quality. Recommendations were made concerning the points which were defective.

St. Charles—On September 22, 1915, an investigation was undertaken on the public water supply, at the request of the president of the school board. The supply was obtained from a drilled well 942 feet in depth. The field data (W) and analytical results (14424 to 14426) showed this supply to have been suitable for public consumption at the time of this investigation.

Winona—On July 17, 1914, an investigation was undertaken on the water supply at the department store of H. Choat & Company, at the request of that company. The field investigation (W) showed that the water supply was well constructed and protected from a sanitary point of view, and the analytical results (13680) showed the absence of dangerous contamination, although a high bacterial count was found.

Winona—On June 11, 1915, an inspection of the public water supply was made, at the request of the Water and Light Commission. The supply was obtained from two dug wells 28 and 38 feet in depth and one drilled well 154 feet in depth. The field investigation (M) showed that no changes had been made in the system since the time of the last inspection. A considerable amount of seepage water was noticed entering the north well on the river side. A sample of this seepage was collected for analysis. A sample was also collected from a new artesian well being installed, for analysis as to hardness and iron content. The analytical results (14257 to 14263) showed the absence of contamination in the west well and the presence of contamination in the north well. The analysis of the seepage showed that it was badly polluted. Recommendations were made for an immediate investigation of the source of this seepage water and the disinfection of the well with calcium hypochlorite.

On June 18, 1915, an investigation was undertaken to find the source of the polluted water entering the north well, and to disinfect the supply therein, at the request of the Water and Light Commission. The field investigation (M) showed the existence of a tunnel reaching horizontally from the small cistern near the edge of the river to the stone wall curbing of the north well. Owing to the high stage of the river, the tunnel was completely filled with water and a considerable amount was passing into the north well through a small opening in the curbing. This tunnel was removed and the space filled with clean sand and gravel. Both north and west wells were disinfected with calcium hypochlorite. Just previous to the completion of this inspection, another source of contamination was found in the north well. This contamination entered through a tunnel leading from the well to the pumping station and at high stage of the river was partially filled with water. The analytical results (14264 to 14272) showed the absence of contamination in the west well both before and after the hypochlorite treatment was applied. These results showed the presence of contamination in the north well before the supply was disinfected and the absence of contamination after the disinfection. The tunnel on the side opposite the river showed the presence of contamination. Recommendations were made for the installation of such construction as would eliminate the contamination from this source. It was recommended that the supply be carefully watched in order to detect any new irregularity.

On September 11, 1915, a follow-up investigation was undertaken on the public water supply. It was found at this time (W) that conditions had been improved, but that certain changes were still necessary in order to eliminate the danger of pollution. The analytical results (14427 to 14431) did not show indications of dangerous contamination. Recommendations were made for the necessary protective construction.

WRIGHT COUNTY

Maple Lake—On January 2, 1914, an investigation was undertaken on the public water supply, at the request of a member of the village council. The supply, at the request of the village recorder. The supply was obtained from a tion (W) showed conditions which were satisfactory, while in the analytical examination (13350 and 13351) indications of contamination were not found.

Waverly—On August 6, 1915, an investigation was undertaken on the public water supply, at the request of a local resident. The supply was obtained from Lake Waverly, and distributed for public consumption without purification. The field investigation (W) showed the lake to be subject to contamination at any

time and an unsafe source from which to obtain the public water supply without adequate purification. The analytical results (14362 to 14364) showed indications of contamination in the water. It was recommended that, if Lake Waverly was to be continued as a source of supply, it be purified by filtration and subsequent chemical treatment. It was suggested that under the prevailing conditions a safer water supply from a sanitary point of view could be obtained by installing an underground supply.

YELLOW MEDICINE COUNTY

Canby—On July 3, 1914, an investigation was undertaken on the public water supply, at the request of the village recorder. The supply was obtained from a dug and drilled well, 31 and 426 feet deep, respectively. The field investigation (W) showed conditions were unsatisfactory, while in the analytical results (13669 to 13672) no indications of contamination were found. Recommendations were made regarding the advisability of installing an additional well, the drilled or driven type being preferred from a sanitary point of view.

On December 8, 1915, a follow-up investigation was undertaken on the public water supply, which was being obtained from a combined dug 89 foot and drilled 426 foot well. The former drilled well was being held in reserve as an emergency supply. The field data (M) showed that repairs had been made on the storage reservoir. They also showed an opening at the top of the well casing on the drilled well. The analytical data (14563 to 14565) indicated that the supply was free from contamination at that time. Recommendations were made for the installation of a water tight construction between the pump and well casings.

Granite Falls—On July 8, 1915, plans were examined (C) for a water supply for the Tuberculosis Sanatorium, at the request of the engineers. This water supply was to be obtained from a drilled well. The plans were recommended for approval.

On December 7, 1915, an investigation was undertaken on the public water supply, at the request of the executive officer. The supply was obtained direct from the Minnesota River and distributed to consumers without purification. The field data (M) showed this supply to be subject to contamination and the analytical data (14560 to 14562) corroborated these findings in showing the presence of contamination. Recommendations were made for the installation of a process of filtration and chemical treatment.

TABLE No. 1
WATER SUPPLY INVESTIGATIONS, JANUARY 1, 1914—JANUARY 1, 1916

No.	Kind	Locality	Re-quested by	Date	Ownership	Source	Results		Recommendation	Result of Follow-up
							Field	Analytical		
1	F-1	Aitkin Co.	(k)	6-3-15	Municipal	Drilled well.	+		Construction	Postponed
2	P-1	Becker Co.	(s)	5-28-15	Sanatorium com.	Drilled well.			Approval.	
3	F-2	Frazeo	(k)	5-5-14	Community	Dug well, 25 ft.	+	+	Construction	Not complied with
4	P-1	Beltrami Co.	(s)	3-11-15	Sanatorium com.	Drilled well.			Approval	
5	F-2	Bemidji	(k)	1-14-15	Municipal	4 drilled wells	+	0	Construction	No replies
6	F-1	Spur	(l)	11-2-15	School Dist. 99	Drilled well			Construction	Work in progress
7	F-2	Williams	(l)	10-14-15	School Dist. 91	Drilled well 70 ft.	0	0	None	
8	F-2	Brown Co.	(e)	1-29-14	Municipal	3 drilled wells 180 ft.	+	+	Construction, treat- ment	Partly complied with
9	F-2	New Ulm.	(e)	2-3-14	Municipal	3 drilled wells 180 ft.	+	0	Construction, oper- ation	Partly complied with
10	F-2	New Ulm.	(e)	2-4-14	Municipal	3 drilled wells 180 ft.	0	0	Construction	Partly complied with
11	F-2	New Ulm.	(e)	3-18-14	Municipal	3 drilled wells 180 ft.	+	0	Construction	Partly complied with
12	F-1	New Ulm.	(s)	4-20-14	Municipal	3 drilled wells 180 ft.	0	0	Approval	Partly complied with
13	F-2	New Ulm.	(e)	12-17-14	Municipal	3 drilled wells 180 ft.	0	+	Treatment	Complied with
14	F-2	New Ulm.	(e)	1-26-15	Municipal	2 drilled wells 180 ft.	0	0	None	
15	F-2	New Ulm.	(e)	12-10-15	Municipal	3 drilled wells, 2 180 ft., 1 365 ft.	+	+	Construction	Work in progress
16	F-2	New Ulm.	(k)	1-30-14	Community	Spring	+	+	Construction, oper- ation	Complied with
17	F-2	New Ulm.	(k)	6-1-14	Community	Spring	0	+	Treatment	Complied with
18	F-2	New Ulm.	(e)	9-10-14	Community	Spring	0	+	None	
19	F-2	New Ulm.	(e)	12-17-14	Community	Spring	0	0	None	
20	F-2	New Ulm.	(q)	3-18-14	Community	Drilled well, 200 ft.	+	+	Environment, const.	Abandoned
21	F-2	New Ulm.	(k)	9-10-14	Community	Dug well 60 ft.	+	+	Construction	Not followed
22	F-2	New Ulm.	(k)	9-10-14	Community	Dug well 30 ft.	+	+	Environment, const.	Not followed
23	F-2	New Ulm.	(k)	9-10-14	Community	Dug well 31 ft.	+	+	Environment, const.	Not followed
24	F-2	New Ulm.	(k)	9-10-14	Community	Dug well 30 ft.	+	+	Environment, const.	Not followed
25	F-2	New Ulm.	(k)	9-10-14	Community	Drilled well 153 ft.	+	+	Construction	Not followed
26	F-2	New Ulm.	(k)	9-10-14	Community	Dug well 20 ft.	+	+	Environment, const.	Not followed

TABLE No. 1—Continued
WATER SUPPLY INVESTIGATIONS, JANUARY 1, 1914—JANUARY 1, 1916

No.	Kind	Locality	Re-quested by	Date	Ownership	Source	Results		Recommendation	Result of Follow-up
							Field	Ana-lytical		
		Brown Co.—Cont.								
27	F-2	New Ulm.....	(k)	9-10-14	Community.....	Spring.....	+	+	Construction.....	Complied with
28	F-2	New Ulm.....	(e)	12-17-14	Community.....	Spring.....	0	0	None.....	None.....
29	F-2	New Ulm.....	(j)	12-10-15	Community.....	Spring.....	0	0	None.....	None.....
30	F-2	Springfield.....	(j)	1-27-15	Municipal.....	4 drilled wells 30-35 ft.	+	+	Construction.....	Partly complied with
31	F-2	Springfield.....	(e)	10-26-15	Municipal.....	4 drilled wells 30-35 ft.	+	+	Construction.....	Complied with
		Carlton Co.								
32	F-2	Barnum.....	(h)	7-15-14	School Dist. 22.....	Drilled well 65 ft.	+	0	Environment, const.	Complied with
33	F-2	Carlton.....	(k)	2-19-15	Municipal.....	Dug well No. 1, 15 ft.	+	0	Construction.....	Not followed
34	F-2	Carlton.....	(k)	2-19-15	Municipal.....	Dug well No. 2, 15 ft.	+	0	Construction.....	Not followed
35	F-2	Carlton.....	(k)	2-19-15	Municipal.....	Dug well No. 3, 16 ft.	+	0	Construction.....	Not followed
36	F-2	Carlton.....	(k)	2-19-15	Municipal.....	Dug well No. 4, 15 ft.	+	0	Construction.....	Not followed
37	F-1	Carlton.....*	(j)	7-21-15	Municipal.....	Otter Creek.....	+	+	Const., treatment...	Work in progress
38	F-2	Cloquet.....	(k)	5-11-14	Municipal.....	Springs.....	+	0	Construction.....	Work in progress
		Cass Co.								
39	F-2	Backus.....	(h)	9-1-14	School Dist. 1.....	Driven well.....	+	+	Construction.....	Abandoned
40	F-2	Onigum.....	(a)	2-27-14	U. S. Govt.....	Dug well 20 ft.	+	+	New source or treat.	Abandoned
41	F-2	Onigum.....	(e)	1-13-15	U. S. Govt.....	Drilled well 58 ft.	0	+	None.....	None.....
42	F-2	Onigum.....	(e)	2-26-15	U. S. Govt.....	Drilled well 58 ft.	+	+	Construction.....	Complied with
43	F-2	State sanatorium.....	(d)	2-27-15	State.....	Leech Lake.....	+	+	New source.....	Not complied with
44	F-2	State sanatorium.....	(d)	12-15-15	State.....	Leech Lake (F).....	+	+	Const., operation...	Partly complied with
		Chippewa Co.								
45	F-2	Maynard.....	(h)	11-30-15	Municipal.....	Drilled well, 83 ft.	0	+	Construction.....	Complied with
46	F-2	Milan.....	(h)	9-22-15	Municipal.....	Dug well 30 ft.	0	+	Construction.....	Complied with
		Chisago Co.								
47	F-2	Taylor's Falls.....	(k)	3-24-14	Municipal.....	Springs.....	+	+	Construction.....	Partly complied with
48	F-2	Taylor's Falls.....	(e)	2-16-15	Municipal.....	Springs.....	+	+	Construction.....	Nothing done
49	F-2	Wyoming.....	(e)	3-11-14	N. P. Ry. Co.....	Driven well 25 ft.	+	+	Construction.....	Complied with
50	F-2	Wyoming.....	(e)	6-18-14	N. P. Ry. Co.....	Driven well 25 ft.	0	0	None.....	None.....
		Clay Co.								
51	F-2	Barnesville.....	(e)	5-6-14	G. N. Ry. Co.....	Whiskey Creek.....	+	+	Abandonment or treatment.....	Abandoned

TABLE No. 1—Continued
 WATER SUPPLY INVESTIGATIONS, JANUARY 1, 1914—JANUARY 1, 1916

No.	Kind	Locality	Re-quested by	Date	Ownership	Source	Results		Recommendation	Result of Follow-up
							Field	Ana-lytical		
		Clay Co.—Cont.								
52	F-2	Barnesville.....	(n)	11-20-14	G. N. Ry. Co.	Dug well 12 ft.	+	+	Abandonment.	Abandoned
53	F-2	Barnesville.....	(n)	8-19-15	G. N. Ry. Co.	Dug well 13 ft.	+	+	Construction.	Complied with
54	F-2	Felton.....	(b)	11-16-15	School Dist. 75.	Drilled well 140 ft.	+	0	Construction.	Work in progress
55	F-2	Moorhead.....	(l)	1-5-14	Municipal	Red riv. of No. (H).	+	+	Operation.	Complied with
56	F-2	Moorhead.....	(l)	3-1-14	Municipal	2 drilled wells.	+	0	Construction.	Partly complied with
			(e)	5-6-14	Municipal	Red river (H).	+	0	Operation.	
57	F-2	Moorhead.....	(e)	5-6-14	Municipal	2 drilled wells.	+	0	Construction.	Complied with
		Cottonwood Cp.								
58	F-2	Mountain Lake.....	(i)	1-27-14	Municipal	2 dug wells, 40-44 ft., drilled well 335 ft.	+	+	Construction.	Complied with
59	F-2	Mountain Lake.....	(e)	12-11-14	Municipal	2 dug wells, 40-44 ft., drilled well 335 ft.	0	0	None.	
60	F-2	Mountain Lake.....	(i)	12-9-15	Municipal	2 dug wells, 40-44 ft., drilled well 335 ft.	+	+	Construction.	Authorized
		Crow Wing Co.								
61	F-2	Brainerd.....	(e)	3-3-14	Municipal	Mississippi river (H).	+	0	New source or treatment.	Under consideration
62	F-2	Brainerd.....	(e)	5-5-14	Municipal	Mississippi river (H).	0	0	New source or treatment.	Under consideration
63	F-2	Brainerd.....	(e)	1-12-15	Municipal	Mississippi river (H).	0	0	None.	Under consideration
64	F-2	Brainerd.....	(l)	5-12-15	Municipal	Mississippi river (H).	0	+	Treatment.	Partly complied with
65	F-1	Brainerd.....	(l)	5-12-15	Municipal	Test wells.	0	0		
66	F-1	Brainerd.....	(l)	11-1-15	Municipal	Test wells.	0	0		
67	F-1	Brainerd.....	(l)	12-29-15	Municipal	Test wells.	+	+		
68	F-2	Brainerd.....	(q)	5-5-14	Community	Drilled well 140 ft.	+	0	Construction.	Complied with
69	F-2	Brainerd.....	(q)	1-12-15	Community	Drilled well 140 ft.	0	0	None.	Not followed
70	F-2	Crosby.....	(e)	8-31-14	W. L. & P. Co.	8 drilled wells 70 ft.	+	+	Const., abandonm't.	
71	F-2	Serpent Lake.....	(q)	8-31-14		Serpent Lake.	+	+		
		Dakota Co.								
72	F-2	Hastings.....	(n)	2-8-15	Municipal	Drilled well 475 ft.	0	0	None.	
73	F-2	So. St. Paul.....	(e)	10-25-14	Union Stk. Yds. Co.	3 drilled wells.	+	+	Construction.	Complied with

TABLE No. 1—Continued
 WATER SUPPLY INVESTIGATIONS, JANUARY 1, 1914—JANUARY 1, 1916

No.	Kind	Locality	Re-quested by	Date	Ownership	Source	Results		Recommendation	Result of Follow-up
							Field	Ana-lytical		
74	F-2	Dodge Co.	(h)	8-31-15	Municipal	Drilled well 243 ft.	+	+	Construction	Partly complied with
75	F-2	Claremont	(c)	12-21-15	Municipal	Drilled well 243 ft.	+	0	Construction	No reply
76	F-2	Douglas Co.	(l)	10-14-15	Municipal	Drilled well 103 ft., dug well 30 ft.	+	0	Construction	Work in progress
77	F-2	Kensington	(k)	8-19-15	Municipal	Drilled well 80 ft.	+	+	Construction	Abandoned
78	F-2	Kensington	(i)	8-19-15	School Dist.	Drilled well 110 ft.	+	+	Construction	Complied with
79	F-2	Faribault Co.	(q)	3-11-15	Municipal	2 drilled wells, 210 ft. and 675 ft.	+	0	Construction	Partly complied with
80	F-2	Blue Earth	(e)	8-10-15	Municipal	2 drilled wells, 210 ft. and 675 ft.	+	+	Construction	Complied with
81	F-2	Elmore	(n)	1-27-14	Municipal	Drilled well 150 ft.	+	+	Construction	Partly complied with
82	F-2	Elmore	(e)	4-4-14	Municipal	Drilled well 150 ft.	+	0	Construction	Partly complied with
83	F-2	Elmore	(e)	12-12-14	Municipal	Drilled well 150 ft.	+	0	Construction	Partly complied with
84	F-2	Elmore	(e)	3-11-15	Municipal	Drilled well 150 ft.	+	+	Construction	No replies
85	F-2	Fillmore Co.	(e)	12-22-15	Municipal	Drilled well 140 ft.	+	0	Construction	Complied with
86	F-2	Spring Valley	(q)	9-7-14	Municipal	2 dug well 15 ft.	+	+	Construction	No replies
87	F-2	Freeborn Co.	(c)	3-16-15	Municipal	2 drilled wells 660 ft. and 448 ft.	+	0	Construction	Work in progress
88	F-2	Goodhue Co.	(k)	1-29-14	Municipal	Drilled well 300 ft.	+	0	Construction	Complied with
89	F-2	Cannon Falls	(s)	2-11-15	Municipal	Drilled well 300 ft.	0	0	None	Complied with
90	F-1	Cannon Falls	(e)	9-9-14	Sanatorium Com.	Spring or drilled well.	+	+	Construction	Complied with
91	F-2	Red Wing	(u)	2-9-15	C. M. & St. P.	Drilled well 450 ft.	+	0	None	Complied with
92	F-2	Red Wing	(c)	8-31-15	C. M. & St. P.	Drilled well 450 ft.	0	0	None	Complied with
93	F-2	Zumbrota	(u)	1-30-14	Municipal	Drilled well 230 ft.	0	0	None	None

TABLE No. 1—Continued
WATER SUPPLY INVESTIGATIONS, JANUARY 1, 1914—JANUARY 1, 1916

No.	Kind	Locality	Re-quested by	Date	Ownership	Source	Results		Recommendation	Result of Follow-up
							Field	Ana-lytical		
		Hennepin Co.								
94	F-2	Crystal Bay.....	(h)	9-2-15	School district..	Dug well 26 ft.	+	+	Construction.....	Complied with
95	F-2	Deephaven.....	(q)	6-11-14	Private.....	Dug well 16 ft.	+	+	Construction.....	Abandoned
96	F-2	Excelsior.....	(k)	3-28-14	School district..	Drilled well 100 ft.	0	0	None.....	Abandoned
97	F-2	Excelsior.....	(h)	10-4-15	School.....	Drilled well 75 ft.	+	+	Const., treatment..	Abandoned
98	P-1	Glen Lake.....	(s)	7-27-14	Sanatorium Com.	Drilled well.....	+	+	Approval.....	Complied with
99	P-1	Glen Lake.....	(r)	8-28-14	Sanatorium Com.	Drilled well.....	+	+	Approval.....	Complied with
100	F-2	Hopkins.....	(h)	8-25-15	Company.....	Drilled well 900 ft.	+	0	Construction.....	Complied with
101	F-2	Hopkins.....	(e)	12-13-15	Company.....	Drilled well 900 ft.	+	0	None.....	Complied with
102	F-2	Hopkins.....	(n)	3-13-14	Dan Patch Ry. Co.	Drilled well 165 ft.	+	0	Construction.....	Complied with
103	F-2	Minneapolis.....	(e)	12-10-15	Dan Patch Ry. Co.	Drilled well 165 ft.	+	0	None.....	Complied with
104	F-2	Minneapolis.....	(n)	2-2-14	N. P. Ry. Co.....	Drilled well 238 ft.	+	0	Construction.....	Complied with
105	F-2	Minneapolis.....	(e)	4-28-15	N. P. Ry. Co.....	Drilled well 238 ft.	0	0	None.....	Complied with
106	F-2	Minneapolis.....	(n)	6-11-15	N. P. Ry. Co.....	Dug and driven well 16 ft.	+	+	Construction.....	Abandoned
107	F-2	Minneapolis.....	(n)	6-11-15	N. P. Ry. Co.....	Drilled well 361 ft.	+	0	Const., environment	Complied with
108	F-2	Minneapolis.....	(n)	6-11-15	N. P. Ry. Co.....	Drilled well 618 ft.	0	0	None.....	Complied with
109	F-2	Minneapolis.....	(s)	8-6-15	Company.....	Drilled well 163 ft.	0	0	None.....	Complied with
110	F-2	Minneapolis.....	(b)	12-21-15	Municipal.....	Spring.....	+	0	Construction or ab- andonment.....	Abandoned
111	F-2	Minneapolis.....	(b)	12-21-15	Municipal.....	Spring.....	+	+	Abandonment.....	Abandoned
112	F-2	Minneapolis.....	(b)	12-21-15	U. S. Govt.....	Spring.....	+	0	Construction.....	Under consideration
113	F-2	Braham Isanti Co.....	(k)	11-3-15	School district..	Driven well 14 ft.	+	0	Environment.....	Authorized
114	F-2	Haseca Co. Bennett Mine Location..	(k)	10-18-15	Mining Company..	Abandoned mine pit..	+	+	Treatment.....	Work in progress
115	F-2	Bogalusa Mine Location..	(m)	10-14-14	Mining Company..	Dug and driven well 71 ft.	+	+	Construction.....	Complied with
116	F-2	Bogalusa Mine Location..	(m)	6-22-15	Mining Company..	Dug and driven well 71 ft.	0	0	None.....	Complied with
117	F-2	Bulgarian Camp.....	(m)	10-14-14	Mining Company..	Dug well 19 ft.	+	+	Construction.....	Complied with
118	F-2	Bulgarian Camp.....	(m)	6-22-15	Mining Company..	Dug well 19 ft.	0	0	None.....	Complied with
119	F-2	Coleraine.....	(m)	10-14-14	Mining Company..	Camsteo mine.....	0	0	None.....	Complied with
120	F-2	Coleraine.....	(m)	6-22-15	Mining Company..	Camsteo mine.....	0	0	None.....	Complied with

TABLE No. 1—Continued
WATER SUPPLY INVESTIGATIONS, JANUARY 1, 1914—JANUARY 1, 1916

No.	Kind	Locality	Re-quested by	Date	Ownership	Source	Results		Recommendation	Result of Follow-up
							Field	Ana-lytical		
121	F-2	Isanti Co.—Cont.	(m)	6-22-15	Mining Company...	Dug well 28 ft.	0	0	None	
122	F-1	Concentrator Power Pl't.	(k)	9-16-15	Municipal	Deep well	+	0	Construction...	Work in progress
123	F-2	Grand Rapids	(k)	11-18-15	Municipal	Dug well 230 ft.	+	0	Const. treatment...	Complied with
124	F-2	Keewatin	(m)	10-14-14	Mining Company...	Hill mine	0	0	None	
125	F-2	Marble	(m)	6-22-15	Mining Company...	Hill mine	0	0	None	
126	F-2	Marble	(m)	6-22-15	Mining Company...	Hill mine	0	0	None	
127	F-2	Taconite	(m)	10-14-14	Mining Company...	Holman mine	+	0	Construction	Complied with
128	F-2	Trout Lake Concentrator	(m)	6-22-15	Mining Company...	Dug well 80 ft.	0	0	None	
129	F-2	Jackson Co.	(q)	6-26-14	Community	Driven well 9 ft.	+	0	Environment, const.	Complied with
130	F-2	Heron Lake	(e)	12-10-14	Community	Driven well 9 ft.	0	0	None	
131	F-2	Heron Lake	(g)	9-12-14	Municipal	Driven well 8 ft.	+	+	Environment, const.	Complied with
132	F-2	Heron Lake	(e)	12-11-14	Municipal	Driven well 8 ft.	0	0	None	
133	F-2	Kandiyohi Co.	(h)	1-7-15	School dist. 57	Drilled well 232 ft.	+	0	Construction	No replies
134	F-2	Kittson Co.	(j)	7-29-14	Municipal	Two Rivers	+	+	Treatment	Complied with
135	F-2	Hallock	(j)	10-5-14	Municipal	Two Rivers (H)	0	0	Operation	Complied with
136	F-2	Koochiching Co.	(e)	2-26-14	Municipal	Rainy river	+	0	New supply	Nothing done
137	F-2	International Falls	(e)	5-4-14	Municipal	Bartlett lake	+	0	Treatment	No replies
138	F-2	Lac qui Parle Co.	(h)	9-2-15	Municipal	Drilled well 62 ft.	+	+	Construction	Complied with
139	F-2	Boyd	(e)	12-1-15	Municipal	Drilled well 62 ft.	0	0	None	
140	F-2	Lake Co.	(n)	10-15-15	D. & I. R. R. R.	Dug well 16 ft.	0	+	None	
141	F-2	Drummond	(n)	5-21-14	D. & I. R. R. R.	Dug well 14 ft.	+	+	Location, environ-ment, construction or abandonment...	Complied with

TABLE No. 1—Continued
 WATER SUPPLY INVESTIGATIONS, JANUARY 1, 1914—JANUARY 1, 1916

No.	Kind	Locality	Re-quested by	Date	Ownership	Source	Results		Recommendation	Result of Follow-up
							Field	Ana-lytical		
142	F-2	Highland	(n)	10-14-15	D. & I. R. R.	Dug well 14 ft.	0	0	None	
143	F-2	Highland	(n)	10-14-15	D. & I. R. R.	Dug well 18 ft.—20 ft.	0	0	None	
144	F-2	Highland	(n)	10-14-15	D. & I. R. R.	Dug well 10 ft.	0	0	None	
145	F-2	Knife River	(c)	10-17-14	D. & N. E. Ry. Co.	Drilled well 156 ft.	0	0	None	
146	F-2	Two Harbors	(c)	2-23-14	Municipal	Lake Superior (H)	0	0	Construction	Complied with
147	F-2	Two Harbors	(c)	10-16-15	Municipal	Lake Superior (H)	0	0	Construction	Complied with
148	F-2	York	(n)	5-21-14	D. & I. R. R.	Dug well 20 ft.	0	0	None	
149	F-2	York	(n)	10-15-15	D. & I. R. R.	Dug well 20 ft.	0	0	None	
150	F-2	York	(n)	10-15-15	D. & I. R. R.	Dug well 14 ft.	+	+	Construction or abandonment	Work in progress
151	F-2	Balaton	(h)	8-19-15	Municipal	Dug well 28 ft.	+	+	Construction	Work in progress
152	F-2	Marshall	(j)	4-23-14	Municipal	Dug and drilled well.	+	+	Construction	Work on new source in progress
153	F-2	McLeod Co.	(q)	11-4-14	Municipal	Drilled well 318 ft.	+	+	Construction	Partly complied with
154	F-2	Stewart	(c)	12-6-15	Municipal	Drilled well 318 ft.	+	0	Construction	Partly complied with
155	F-2	Triumph	(h)	8-19-15	Municipal	Drilled well 116 ft.	+	0	Construction	Partly complied with
156	F-2	Meeker Co.	(h)	10-1-15	Municipal	2 drilled wells 40 ft. and 42 ft.	+	0	Construction	Authorized
157	F-2	Mille lacs Co.	(k)	10-28-14	Gt. Nor. Ry. Co.	Dug well 26 ft.	+	+	Construction	Abandoned
158	F-2	Princeton	(h)	11-19-15	Municipal	Drilled well 180 ft.	+	+	Const., treatment	Complied with
159	F-2	Morrison Co.	(n)	1-19-14	Water & Power Co.	Mississippi (H)	0	0	Operation	Complied with
160	F-2	Little Falls	(e)	11-16-15	Water & Power Co.	Mississippi (H)	0	0	None	

TABLE No. 1—Continued
WATER SUPPLY INVESTIGATIONS, JANUARY 1, 1914—JANUARY 1, 1916

No.	Kind	Locality	Re-quested by	Date	Ownership	Source	Results		Recommendation	Result of Follow-up
							Field	Ana-lytical		
161	F-2	Mower Co. Austin.....	(n)	2-10-15	C.M. & St.P.Ry.Co.	Dug and drilled well 271 ft.....	+	0	Construction.....	Complied with
162	F-2	Austin.....	(e)	12-21-15	C.M. & St.P.Ry.Co.	Dug and drilled well 271 ft.....	+	0	Construction.....	Complied with
163	F-2	Le Roy.....	(h)	12-21-15	Municipal.....	Drilled well 426 ft.....	+	0	Construction.....	Under consideration
164	F-2	Le Roy.....	(h)	12-21-15	School district.....	Drilled well 70 to 80 ft.	0	0	Environment.....	Not complied with
165	F-2	Murray Co. Currie.....	(n)	6-24-14	Municipal.....	Drilled well 160 ft.....	+	+	Const., environment	Complied with
166	F-2	Currie.....	(k)	9-11-14	Municipal.....	Drilled well 160 ft.....	0	0	None.....	Complied with
167	F-2	Currie.....	(n)	6-24-14	C.St.P.M. & O.Ry.	Dug and driven well 18 ft.....	+	+	Abandonment.....	Abandoned
168	F-2	Nicollet Co. North Mankato.....	(j)	9-10-14	Municipal.....	Drilled well 400 ft.....	0	0	None.....	Complied with
169	F-2	Nobles Co. Bigelow.....	(n)	9-13-14	C.St.P.M. & O.Ry.	Dug well 14 ft.....	+	+	Construction.....	Complied with
170	F-2	Bigelow.....	(e)	12-10-14	C.St.P.M. & O.Ry.	Dug well 14 ft.....	0	0	None.....	Complied with
171	F-2	Bigelow.....	(j)	8-14-15	C.St.P.M. & O.Ry.	Dug well 14 ft.....	0	0	None.....	Not complied with
172	F-2	Bigelow.....	(e)	12-9-14	Municipal.....	Dug well 57 ft.....	+	+	Construction.....	Partly complied With
173	F-2	Ellsworth.....	(e)	8-13-15	Municipal.....	Dug well 57 ft.....	+	+	Construction.....	Complied with
174	F-2	Worthington.....	(j)	12-10-14	Municipal.....	2 drilled wells, 1 dug and drilled.....	+	0	Construction.....	Complied with
175	F-2	Worthington.....	(e)	8-12-15	Municipal.....	2 drilled wells, 1 dug and drilled.....	0	0	None.....	Complied with
176	P-1	Worthington.....	(r)	6-9-15	Sanatorium Com.....	Drilled well.....	.....	.....	Approval.....	Complied with
177	F-2	Norman Co. Ada.....	(k)	2-23-15	Municipal.....	4 drilled wells 240 ft. to 253 ft.....	+	0	Construction.....	Complied with
178	F-2	Ada.....	(e)	11-16-15	Municipal.....	4 drilled wells 240 ft. to 253 ft.....	0	0	None.....	Complied with
179	F-2	Olmsted Co. Eyota.....	(k)	4-3-14	Municipal.....	Drilled well 203 ft.....	+	+	Construction.....	Partly complied with
180	F-2	Eyota.....	(e)	2-9-15	Municipal.....	Drilled well 203 ft.....	+	+	Construction.....	Complied with
181	F-2	Eyota.....	(n)	4-3-14	C. & N.W.Ry.Co.....	Drilled well 135 ft.....	0	0	None.....	Complied with
182	F-2	Rochester.....	(o)	5-6-14	Water Co.....	Drilled well 418 ft., 3 dug wells 30 ft.....	0	0	None.....	Complied with

TABLE No. 1—Continued
 WATER SUPPLY INVESTIGATIONS, JANUARY 1, 1914—JANUARY 1, 1916

No.	Kind	Locality	Re-quested by	Date	Ownership	Source	Results		Recommendation	Result of Follow-up
							Field	Ana-lytical		
183	F-2	Otter Tail Co. Fergus Falls.....	(k)	8-1-14	Water Co.....	Otter Tail river (H) Hoot Lake.....	+	.....	Operation, treatment	Partly complied with
184	F-2	Fergus Falls.....	(e)	11-19-14	Water Co.....	Otter Tail river (H) Hoot Lake.....	0	0	Treatment.....	Complied with
185	F-2	Fergus Falls.....	(l)	11-19-14	Water Co.....	Otter Tail river Hoot lake and reservoirs.	+	+	Environment, treat.	Work in progress
186	F-2	Fergus Falls.....	(k)	11-19-14	Company.....	2 driven well 12 ft and 15 ft.....	0	+	Construction.....	Complied with
187	F-2	Fergus Falls.....	(e)	2-22-15	Company.....	2 driven wells 12 ft and 15 ft.....	0	0	None.....	Abandoned
188	F-2	Fergus Falls.....	(n)	2-22-15	Company.....	Bored well 14.....	+	+	Construction.....	Not followed up
189	F-2	Battle Lake.....	(g)	4-27-15	Sanatorium Com...	Dug well.....	.....	.....	Construction.....	.....
190	F-2	Pine Co. Sandstone.....	(k)	2-2-15	Company.....	Drilled well 732 ft.....	0	0	Treatment (phys.)...	.....
191	F-2	Pipestone Co. Pipestone.....	(a)	3-20-14	U. S. Govt.....	3 dug well 22 ft., 20 ft. and 20 ft.....	+	0	Const. environment	Complied with
192	F-2	Pipestone.....	(e)	12-9-15	U. S. Govt.....	3 dug wells 22 ft., 20 ft. and 20 ft.....	0	0	None.....	.....
193	F-2	Pipestone.....	(e)	12-8-15	Municipal.....	2 drilled wells 196 ft..	0	0	None.....	.....
194	F-2	Polk Co. Crookston.....	(e)	2-28-14	Water Co.....	Red Lake river (S., F., H), 3 drilled wells 210, 230, and 170 ft.	+	0	Construction.....	Partly complied with
195	F-2	Crookston.....	(o)	4-2-14	Water Co.....	Red Lake river (S., F., H), 3 drilled wells 210, 230, and 170 ft.	.....	.....	Construction.....	Nothing done
196	F-2	Crookston.....	(e)	7-30-14	Water Co.....	Red Lake river (S., F., H), 3 drilled wells 210, 230, and 170 ft.	.....	.....	Construction.....	Nothing done
197	P-1	Crookston.....	(r)	5 11-15	Sanatorium Com...	Drilled well.....	0	0	Construction.....	Under consideration
198	F-2	East Grand Forks.....	(n)	2-28-14	Municipal.....	Red Lake river (H).....	+	0	Approval.....	Not followed up
199	F-2	Fertile.....	(k)	10-8-14	Municipal.....	Drilled well 292 ft.....	0	0	Construction.....	Complied with

TABLE No. 1—Continued
WATER SUPPLY INVESTIGATIONS, JANUARY 1, 1914—JANUARY 1, 1916

No.	Kind	Locality	Re-quested by	Date	Ownership	Source	Results		Recommendation	Result of Follow-up
							Field	Ana-lytical		
200	F-2	Ramsey Co. North St. Paul	(g)	7-13-15	C. B. & Q. Ry. Co.	Silver lake.	+	+	Treatment.....	Complied with
201	F-2	Dayton's Bluff	(n)	2-11-14	C. B. & Q. Ry. Co.	Spring	+	0	Construction.....	Complied with
202	F-2	Dayton's Bluff	(e)	4-23-14	N. P. Ry. Co.	Drilled well 227 ft.	+	0	None.....	Complied with
203	F-2	St. Paul	(n)	2-3-15	N. P. Ry. Co.	Drilled well 227 ft.	+	0	Construction.....	Complied with
204	F-2	St. Paul	(n)	12-16-15	N. P. Ry. Co.	Drilled well 227 ft.	+	0	None.....	Complied with
205	F-2	St. Paul	(n)	9-1-15	N. P. Ry. Co.	Drilled well 356 ft.	0	0	None.....	
206	F-2	Uversty Farm	(f)	2-15-15	State.	2 drilled wells 270 and 280 ft.	+	+	Construction.....	Complied with
207	F-2	White Bear	(e)	3-11-14	N. P. Ry. Co.	Drilled well 700 ft.	+	+	Const., environment	Partly complied with
208	F-2	White Bear	(e)	6-18-14	N. P. Ry. Co.	Drilled well 700 ft.	+	+	Const., environment	Complied with
209	F-2	White Bear	(e)	10-30-14	N. P. Ry. Co.	Drilled well 700 ft.	0	+	None.....	
210	F-2	White Bear	(e)	11-24-14	N. P. Ry. Co.	Drilled well 700 ft.	0	0	None.....	
211	F-2	White Bear	(e)	10-4-15	Municipal	Drilled well 350 ft.	+	0	Const., environment	Complied with
212	F-2	Red Lake Co. Red Lake Falls	(e)	7-30-14	Municipal	Dug 52 ft.; drilled 209 ft.	+	0	Const. treatment...	Complied with
213	F-2	Red Lake Falls	(e)	2-24-15	Municipal	Dug 52 ft.; drilled 209 ft.	+	0	None.....	
214	F-2	Redwood Co. Lamberton	(h)	8-8-15	Municipal	Drilled well 65 ft.	+	+	Construction.....	Partly complied with
215	F-2	Lamberton	(e)	10-26-15	Municipal	Drilled well 65 ft.	+	+	Construction.....	Abandoned
216	F-2	Sanborn	(n)	1-29-14	C. & N. W. Ry. Co.	Drilled well 360 ft.	+	+	Construction.....	Abandoned
217	F-2	Walnut Grove	(h)	9-1-15	Municipal	2 drilled wells	+	+	Construction.....	Complied with
218	F-2	Renville Co. Morton	(k)	1-28-15	Municipal	Spring	+	0	Location, construc- tion.....	Nothing done
219	F-2	Rice Co. Faribault	(e)	4-10-14	State	Drilled well 746 ft.	0	0	None.....	
220	F-2	Faribault	(e)	4-10-14	Municipal	2 dug wells, 20 ft., 3 drilled wells 1056 ft., 800 ft and 1,160 ft.	0	0	Abandonment (dug wells)	
221	F-2	Faribault	(n)	2-10-15	C. M. & St. P. Ry.	Dug well 47 ft.	+	+	Construction.....	Partly complied with
222	F-2	Faribault	(e)	9-2-15	C. M. & St. P. Ry.	Dug well 47 ft.	+	+	Construction.....	Abandoned
223	F-2	Northfield	(e)	7-17-14	Municipal	Drilled well 360 ft.	+	+	Construction.....	Complied with

TABLE No. 1—Continued
WATER SUPPLY INVESTIGATIONS, JANUARY 1, 1914—JANUARY 1, 1916

No.	Kind	Locality	Re-quested by	Date	Ownership	Source	Results		Recommendation	Result of Follow-up
							Field	Ana-lytical		
224	F-2	Rock Co.		6-26-14	School.....	Drilled well 160 ft.....	0	0	None.....	
225	F-2	Beaver Creek.....	(h)	6-26-14	Municipal.....	Dug and drilled well 73 ft.....	+	+	Const., environment	Complied with
226	F-2	Beaver Creek.....	(e)	12-9-14	Municipal.....	Dug and drilled well 73 ft.....	0	0	None.....	
227	F-2	Beaver Creek.....	(e)	8-12-15	Municipal.....	Dug and drilled well 73 ft.....	0	0	None.....	
228	F-2	Luverne.....	(k)	7-2-14	Municipal.....	2 dug wells.....	+	+	Construction.....	Abandoned
229	F-1	Luverne.....	(l)	7-2-14	Municipal.....	Springs, water shed.....	+	+	New source.....	Complied with
230	F-2	Luverne.....	(l)	8-13-15	Municipal.....	Drilled well 278 ft.....	0	0	.....
231	F-2	Roseau Co.		12-17-15	Community.....	Bored well 20 ft.....	0	0	Construction.....	Not followed up
232	F-2	Warroad.....	(c)	12-17-15	Community.....	Drilled well 140 ft.....	0	0	Construction.....	Not followed up
233	F-2	Warroad.....	(c)	12-17-15	Community.....	Drilled well 110 ft.....	0	0	Environment.....	Not followed up
234	F-2	Warroad.....	(c)	12-17-15	Municipal.....	Warroad river.....	+	+	Abandonment, new source.....	Under consideration
235	F-2	St. Louis Co.		5-20-14	D. & I. R. R. R.....	Dug well 20 ft.....	+	0	Construction.....	Complied with
236	F-2	Allen Junction.....	(n)	10-13-15	D. & I. R. R. R.....	Dug well 20 ft.....	0	0	None.....	
237	F-2	Allen Junction.....	(n)	10-13-15	D. & I. R. R. R.....	Dug well 24 ft.....	0	0	None.....	
238	F-2	Alpena Location.....	(m)	10-7-14	Mining Co.....	Alpena mine.....	0	0	None.....	
239	F-2	Alpena Location.....	(m)	6-26-15	Mining Co.....	Alpena mine.....	0	0	None.....	
240	F-2	Aurora.....	(n)	5-21-14	D. & I. R. R. R.....	Dug well 32 ft.....	0	0	None.....	
241	F-1	Aurora.....	(k)	7-17-14	Municipal.....	White Water lake.....	0	+	Treatment.....	Not installed
242	F-2	Miller Mine.....	(k)	6-4-14	Mining Co.....	Dug well 20-25 ft.....	+	+	Construction.....	Partly complied with
243	F-2	Miller Mine.....	(k)	9-14-15	Mining Co.....	Dug well 20-25 ft.....	+	+	Environment, const.	Not complied with
244	F-2	Miller Mine.....	(k)	6-4-14	Mining Co.....	Miller Mine.....	+	+	Abandonment.....	Abandoned
245	F-2	Meadow Mine.....	(k)	6-4-14	Mining Co.....	Meadow Mine.....	+	+	Construction.....	Partly complied with
246	F-2	Meadow Mine.....	(e)	9-14-15	Mining Co.....	Meadow Mine.....	+	0	Construction.....	Complied with
247	F-2	Mohawk Mine.....	(e)	11-19-15	Mining Co.....	Meadow Mine.....	+	0	None.....	
248	F-2	Mohawk Mine.....	(k)	6-4-14	Mining Co.....	Mohawk Mine.....	+	0	Construction.....	Partly complied with
249	F-2	Mohawk Mine.....	(e)	11-19-15	Mining Co.....	Mohawk Mine.....	+	+	Construction.....	Partly complied with
250	F-2	Stephens Mine.....	(k)	6-4-14	Mining Co.....	Driven well 72 ft.....	+	0	Construction.....	Complied with

TABLE No. 1—Continued
WATER SUPPLY INVESTIGATIONS, JANUARY 1, 1914—JANUARY 1, 1916

No.	Kind	Locality	Re-quested by	Date	Ownership	Source	Results		Recommendation	Result of Follow-up
							Field	Ana-lytical		
		St. Louis Co.—Cont.								
251	F-2	Bangor Mine.....	(m)	10-19-15	Mining Co.....	Bangor Mine.....	0	0	None.....	No replies
252	F-2	Belgrade Mine.....	(n)	10-19-15	Mining Co.....	Belgrade Mine.....	0	0	None.....	
253	F-2	Biwabik.....	(n)	5-21-14	D. & I. R. R. R.....	Drilled well 312 ft.....	0	0	None.....	
254	F-2	Biwabik.....	(k)	11-19-15	Municipal.....	Dug well 332 ft.....	+	+	Construction.....	
255	F-2	Breda.....	(n)	5-21-14	D. & I. R. R. R.....	Dug well 18 ft.....	0	0	None.....	
256	F-2	Breda.....	(n)	10-14-15	D. & I. R. R. R.....	Dug well 18 ft.....	0	0	None.....	
257	F-2	Brimson.....	(n)	5-21-14	D. & I. R. R. R.....	Dug well 14 ft.....	0	0	None.....	
258	F-2	Brimson.....	(n)	10-14-15	D. & I. R. R. R.....	Dug well 14 ft.....	0	0	None.....	
259	F-2	Brimson.....	(n)	10-14-15	D. & I. R. R. R.....	Dug well 18 ft.....	0	0	None.....	
260	F-2	Chisholm.....	(l)	1-9-14	Municipal.....	Monroe Mine (H).....	0	0	None.....	
261	P-1	Chisholm.....	(l)	9-2-14	Municipal.....	Monroe Mine (S,F,H).....	0	0	Approval.....	
262	F-2	Chisholm.....	(l)	10-11-14	Mining Co., municipal- pal.....	Monroe Mine (S,F,H).....	0	0	None.....	
263	F-2	Colby.....	(n)	5-21-15	D. & I. R. R. R.....	Dug well 18 ft.....	0	0	Construction.....	Complied with
264	F-2	Colby.....	(n)	10-13-15	D. & I. R. R. R.....	Dug well 18 ft.....	0	0	None.....	
265	F-2	Cook.....	(k)	1-18-15	Community.....	Spring.....	+	+	Construction.....	Complied with
266	F-2	Cook.....	(e)	10-13-15	Community.....	Spring.....	+	+	Construction.....	Complied with
267	F-2	Deacon Location.....	(e)	6-26-15	Mining Co.....	Deacon Mine.....	0	0	None.....	
268	F-2	Duluth.....	(e)	10-17-14	Municipal.....	Lake Superior (H).....	0	0	None.....	
269	F-2	Duncan Location.....	(e)	6-24-15	Mining Co.....	Duncan Mine.....	0	0	None.....	
270	F-2	Elba Location.....	(m)	5-12-14	Mining Co.....	Elba Mine.....	+	0	Construction.....	Complied with.
271	F-2	Elba Location.....	(m)	12-22-14	Mining Co.....	Elba Mine.....	+	0	Construction.....	Complied with
272	F-2	Elba Location.....	(m)	9-14-15	Mining Co.....	Elba Mine.....	+	+	Abandonment.....	Not followed up
273	F-2	Ely.....	(k)	1-7-14	Private.....	Dug well Shagawa lake.....	+	+	None.....	
274	F-2	Ely.....	(k)	1-7-14	Municipal.....	Shagawa lake (F, H).....	0	0	None.....	
275	F-2	Ely.....	(e)	2-25-14	Municipal.....	Shagawa lake (F, H).....	0	0	None.....	
276	F-2	Ely.....	(e)	4-8-14	Municipal.....	Shagawa lake (F, H).....	0	0	None.....	
277	F-2	Ely.....	(e)	5-12-14	Municipal.....	Shagawa lake (F, H).....	0	0	None.....	
278	F-2	Ely.....	(e)	7-18-14	Municipal.....	Shagawa lake (F, H).....	0	0	Operation.....	Partly complied with
279	F-2	Ely.....	(e)	10-16-14	Municipal.....	Shagawa lake (F, H).....	0	0	Operation.....	Complied with
280	F-2	Ely.....	(k)	7-29-15	Municipal.....	Shagawa lake (F, H).....	+	+	None.....	
281	P-1	Ely.....	(r)	9-13-15	Municipal.....	Shagawa lake (F, H).....	0	0	Approval.....	
282	F-2	Embarrass.....	(m)	6-27-15	Mining Co.....	Driven well 18 ft.....	+	0	Construction.....	Complied with
283	F-2	Embarrass.....	(m)	5-20-14	D. & I. R. R. R.....	Dug well 9 ft.....	0	0	None.....	
284	F-2	Embarrass.....	(n)	10-13-15	D. & I. R. R. R.....	Dug well 9 ft.....	0	0	None.....	

TABLE No. 1—Continued
 WATERSUPPLY INVESTIGATIONS, JANUARY 1, 1914—JANUARY 1, 1916

No.	Kind	Locality	Re-quested by	Date	Ownership	Source	Results		Recommendation	Result of Follow-up
							Field	Ana-lytical		
		St. Louis Co.—Cont.								
285	F-2	Eveleth	(m)	10-8-14	Municipal	St. Mary's lake	+	0	Environment	Not followed up
286	F-2	Fairbanks	(n)	5-21-14	D. & I. R. R.	Dug well 26 ft.	+	0	Environment, const.	Complied with
287	F-2	Fairbanks	(n)	10-14-15	D. & I. R. R.	Dug well 26 ft.	0	0	None	Complied with
288	F-2	French River	(m)	5-22-14	D. & I. R. R.	Dug well 28 ft.	+	0	Construction	Complied with
289	F-2	French River	(m)	10-15-15	D. & I. R. R.	Dug well 28 ft.	0	0	Treatment	Complied with
290	F-2	Genoa Location	(m)	10-8-14	Mining Co.	Genoa Mine	0	0	None	Complied with
291	F-2	Genoa Location	(m)	6-25-15	Mining Co.	Genoa Mine	0	0	Treatment	Complied with
292	F-1	Gilbert	(m)	10-8-14	Municipal	Ely or Cedar Island lake	+	0	Treatment	Complied with
293	F-1	Gilbert	(j)	1-14-15	Municipal	Ely lake	.....	.....	Location	Complied with
294	F-1	Gilbert	(f)	3-23-15	Municipal	Ely lake	.....	.....	Approval	.....
295	F-2	Glen Location	(m)	10-10-14	Mining Co.	Glen Mine	0	0	None	.....
296	F-2	Glen Location	(m)	6-24-15	Mining Co.	Glen Mine	0	0	None	.....
297	F-2	Graham Location	(m)	6-27-15	Mining Co.	Graham Mine	+	+	Construction	Complied with
298	F-2	Hartley Location	(m)	10-10-14	Mining Co.	Hartley Mine	0	0	Construction	Complied with
299	F-2	Hartley Location	(m)	6-24-15	Mining Co.	Hartley Mine	0	0	None	.....
300	F-2	Hibbing	(l)	7-16-14	Mining Co.	Penobscot Mine	0	0	None	.....
301	F-2	Hibbing	(l)	7-16-14	Mining Co.	Scranton Mine	+	+	Treatment	Complied with
302	F-2	Hibbing	(m)	10-13-14	Municipal and mining companies	Mine drifts and stumps	+	+	Treatment	Complied with
303	F-2	Hibbing	(l)	1-12-15	Mining Co.	Scranton Mine (H)	0	0	None	.....
304	F-2	Hibbing	(m)	5-26-15	Mining Co.	Scranton Mine (H)	0	0	None	.....
305	F-1	Hibbing	(p)	10-14-14	Municipal	Test wells	0	0	.....	.....
306	F-1	Hibbing	(p)	12-21-14	Municipal	Test wells	0	+	.....	.....
307	F-1	Hibbing	(p)	3-31-15	Municipal	Test wells	0	+	.....	.....
308	F-1	Hibbing	(p)	5-24-15	Municipal	Test wells	0	+	.....	.....
309	F-2	Hopper	(m)	9-15-15	D. W. & P. Ry. Co.	Test wells	0	0	.....	.....
310	F-2	Hull-Rust Yards	(m)	6-2-14	D. M. & N. Ry. Co.	Drilled well 60 ft.	+	0	Construction	Complied with
311	F-2	Hull-Rust Yards	(e)	9-13-15	D. M. & N. Ry. Co.	Dug well 92 ft.	+	0	Construction	Complied with
312	F-2	Kinney	(q)	4-9-14	Mining Co.	Dug well 92 ft.	0	0	None	.....
313	F-2	Kinney	(e)	12-22-14	Mining Co.	Cavours Mine	0	0	None	.....
314	F-1	Kinney	(k)	12-22-14	Municipal	.....	.....	.....	.....	.....
315	F-1	Kinney	(e)	2-1-15	Municipal	Dug well	.....	.....	.....	.....
316	F-2	Kinney	(k)	7-30-15	Municipal	Dug well 187 ft.	+	0	Construction	Partly complied with
317	F-2	Kinney	(k)	11-18-15	Municipal	Dug well 187 ft.	+	0	Const., treatment	Work in progress

TABLE No. 1—Continued
WATER SUPPLY INVESTIGATIONS, JANUARY 1, 1914—JANUARY 1, 1916

No.	Kind	Locality	Re-quested by	Date	Ownership	Source	Results		Recommendation	Result of Follow-up
							Field	Ana-lytical		
		St. Louis Co.—Cont.								
318	F-2	Leonidas Location.	(m)	10-8-14	Mining Co.	Leonidas Mine.	0	0	None.	
319	F-2	Leonidas Location.	(m)	6-25-15	Mining Co.	Leonidas Mine.	0	0	None.	
320	F-2	McKinley	(n)	6-5-14	Municipal	Dug 29 ft., driven 27 ft.	+	+	Environment, const.	New system
321	F-2	Mariska.	(n)	5-21-14	D. & I. R. R.	Dug well 39 ft.	+	+	Construction.	Complied with
322	F-2	Mariska.	(n)	10-13-15	D. & I. R. R.	Dug well 39 ft.	+	+	Construction, treat-ment.	Complied with
323	F-2	Mitchell.	(n)	6-2-14	D. M. & N. Ry. Co.	Dug 30 ft., drilled 45 ft.	0	0	None.	
324	F-2	Monroe Location.	(m)	10-10-14	Mining Co.	Monroe Mine.	0	0	None.	
325	F-2	Monroe Location.	(m)	6-24-15	Mining Co.	Monroe Mine.	0	0	None.	
326	F-2	Morris Location.	(m)	10-12-14	Mining Co.	Morris Mine.	+	+	Construction.	Complied with
327	F-2	Morris Location.	(m)	6-23-15	Mining Co.	Morris Mine.	0	0	None.	
328	F-2	Mt. Iron.	(e)	6-3-14	Municipal.	Mine shaft and sump.	0	0	None.	
329	F-2	Myers Location.	(m)	10-10-14	Mining Co.	Myers Mine.	+	+	Construction.	Complied with
330	F-2	Myers Location.	(m)	6-24-15	Mining Co.	Myers Mine.	0	0	None.	
331	F-2	Norman Location.	(m)	10-7-14	Mining Co.	Norman Mine.	+	+	Construction.	Complied with
332	F-2	Norman Location.	(m)	6-25-15	Mining Co.	Norman Mine.	0	0	None.	
333	F-2	Nopeming.	(g)	11-10-15	Sanatorium Com.	2 drilled wells 208 ft., and 298 ft.	+	+	Construction.	In progress
334	F-2	Palmers.	(n)	5-22-14	D. & I. R. R. R.	Dug well 48 ft.	+	+	Construction.	Complied with
335	F-2	Palmers.	(n)	10-15-15	D. & I. R. R. R.	Dug well 48 ft.	0	0	None.	
336	F-2	Penobscot Location.	(m)	10-12-14	Mining Co.	Penobscot Mine.	0	0	None.	
337	F-2	Penobscot Location.	(m)	6-23-15	Mining Co.	Penobscot Mine.	0	0	None.	
338	F-2	Rainy Jct.	(c)	5-3-14	D. M. & N. Ry. Co.	Drilled well 45 ft.	0	0	None.	
339	F-2	Robinson.	(n)	5-20-14	D. & I. R. R. R.	Dug well 12 ft.	+	+	None.	
340	F-2	Robinson.	(n)	10-13-15	D. & I. R. R. R.	Dug well 12 ft.	0	0	Construction.	Complied with
341	F-2	Sheridan Location.	(m)	10-12-14	Mining Co.	Dug well 42 ft.	+	+	Treatment.	Complied with
342	F-2	Sheridan Location.	(m)	6-23-15	Mining Co.	Dug well 42 ft.	0	0	Construction.	Complied with
343	F-2	Shiras Location.	(m)	6-26-15	Mining Co.	Shiras Mine.	0	0	None.	
344	F-1	Sibley Location.	(m)	2-25-14	Mining Co.	Shagawa lake or under-ground source	+	+	New supply or treat-ment	Complied with
345	F-2	Sibley Location.	(m)	6-27-15	Mining Co.	Dug well 17 ft.	0	+	Treatment.	Complied with
346	F-2	Skibo.	(n)	5-21-14	D. & I. R. R. R.	Dug well 13 ft.	0	0	Construction.	Complied with
347	F-2	Skibo.	(n)	10-14-15	D. & I. R. R. R.	Dug well 13 ft.	0	0	None.	

TABLE No. 1—Continued
 WATER SUPPLY INVESTIGATIONS, JANUARY 1, 1914—JANUARY 1, 1916

No.	Kind	Locality	Re-quested by	Date	Ownership	Source	Results		Recommendation	Result of Follow-up
							Field	Ana-lytical		
348	F-2	St. Louis Co.—Cont. Soudan Location.....	(m)	6-25-15	Mining Co.....	6 dug wells 20 ft. to to 67 ft.....	0	+	Treatment..... Construction.....	Complied with Complied with Complied with
349	F-2	Sparta.....	(n)	5-21-14	D. & I. R. R. R.....	Dug well 25 ft.....	0	+	Treatment.....	Complied with
350	F-2	Sparta.....	(n)	10-14-15	D. & I. R. R. R.....	Dug well 25 ft.....	0	0	Treatment.....	Complied with
351	F-2	Sparta.....	(m)	6-27-15	Mining Co.....	Stephens Mine.....	0	0	None.....	Complied with
352	F-2	Summit Location.....	(n)	5-21-14	D. & I. R. R. R.....	Dug well 43 ft.....	0	0	Construction.....	Complied with
353	F-2	Summit.....	(n)	10-13-15	D. & I. R. R. R.....	Dug well 43 ft.....	0	0	None.....	Abandoned
354	F-2	Tower Jet.....	(n)	5-20-14	D. & I. R. R. R.....	Dug well 6 ft.....	0	0	Abandonment.....	Complied with
355	F-2	Troy Location.....	(n)	10-13-15	D. & I. R. R. R.....	Dug well 18 ft.....	0	0	Treatment.....	Complied with
356	F-2	Troy Location.....	(m)	9-14-15	Mining Co.....	Dug well 65 ft.....	0	+	Construction.....	Complied with
357	F-2	Virginia.....	(m)	10-7-14	Municipal.....	3 drilled wells, 415 ft., 741 ft. and 721 ft.....	0	0	None.....	Nothing done
358	F-2	Wanless Location.....	(m)	6-25-15	Mining Co.....	Wanless Mine.....	0	0	Environment, oper- ation.....	Nothing done
359	F-2	Winton.....	(k)	5-14-14	Companies.....	Fall Lake (H).....	0	+	Construction.....	Nothing done
360	F-2	Winton.....	(k)	7-18-14	Companies.....	Fall lake (H).....	0	+	Construction.....	Nothing done
361	F-2	Sherburne Co. Big Lake.....	(h)	1-21-14	School district.....	Driven well 18 ft.....	0	0	None.....	Complied with
362	F-2	Stearns Co. Melrose.....	(n)	2-22-15	G. N. Ry. Co.....	Dug and driven well 21 ft.....	0	0	Construction.....	Complied with
363	F-2	Melrose.....	(e)	6-30-15	G. N. Ry. Co.....	Dug and driven well 21 ft.....	0	0	None.....	Complied with
364	F-2	St. Cloud.....	(h)	1-19-14	School board.....	Drilled well 68 ft.....	0	0	None.....	Complied with
365	F-2	St. Cloud.....	(e)	3-3-14	Municipal.....	Mississippi (H).....	0	0	None.....	Complied with
366	F-2	St. Cloud.....	(q)	10-28-14	Community.....	Drilled well 70 ft.....	0	0	Construction.....	Nothing done
367	F-2	Sauk Center.....	(q)	10-28-14	Municipal.....	Sauk river.....	0	+	Treatment or con- struction.....	Nothing done
368	F-1	Sauk Center.....	(q)	10-28-14	Municipal.....	Sauk river or wells.....	0	+	Treatment or con- struction.....	Nothing done
369	F-2	Steel Co. Owatonna.....	(e)	9-9-14	Water Co.....	Spring.....	0	+	Construction.....	Abandoned

TABLE No. 1—Continued
WATER SUPPLY INVESTIGATIONS, JANUARY 1, 1914—JANUARY 1, 1916

No.	Kind	Locality	Re-quested by	Date	Ownership	Source	Results		Recommendation	Result of Follow-up
							Field	Ana-lytical		
370	F-2	Swift Co. Benson.....	(e)	8-12-14	Municipal.....	2 drilled wells 160 ft. and 167 ft.	+	+	Construction, treat- ment.	Partly complied with
371	F-2	Benson.....	(j)	11-23-14	Municipal.....	2 drilled wells 160 ft. and 167 ft. (H).....	+	0	Construction.....	Complied with
372	F-2	Benson.....	(e)	12-23-14	Municipal.....	2 drilled wells 160 ft. and 167 ft. (H).....	0	0	None.....	
373	F-2	Benson.....	(k)	9-23-15	Municipal.....	2 drilled wells 160 ft. and 167 ft. (H).....	0	0	None.....	
374	F-2	Todd Co. Long Prairie.....	(l)	6-2-15	Municipal.....	Drilled well 180 ft.....	+	0	Construction.....	Abandoned
375	F-2	Staples.....	(n)	3-2-14	Municipal.....	Dug and drilled well 75 ft.	+	0	Abandonment, con- struction	Partly complied with
376	F-2	Staples.....	(c)	2-27-15	Municipal.....	Dug and drilled well 75 ft.....	+	0	Abandonment, con- struction	No reply
377	F-2	Traverse Co. Browns Valley.....	(n)	12-3-14	Municipal.....	4 dug wells 10 ft. to to 12 ft.....	+	+	Construction.....	No reply
378	F-2	Wabasha Co. Hammond.....	(j)	11-12-14	Municipal.....	Drilled well 225 ft.....	+	0	Abandonment, cons- truction	Work authorized
379	F-2	Lake City.....	(n)	12-20-15	C.M. & St.P.Ry.Co.	Dug well.....	+	+	Construction.....	Abandoned
380	F-2	Wabasha.....	(n)	2-9-15	C.M. & St.P.Ry.Co.	2 dug wells 50 ft. and 65 ft.....	+	+	Construction.....	Complied with
381	F-2	Washington Co. Mahtomedi.....	(h)	3-11-14	School district.....	Drilled well 130 ft.....	+	0	Construction.....	No reply
382	F-2	St. Croix River.....	(e)	3-5-15	Municipal.....	St. Croix river.....	+	+	Abandonment.....	No reply
383	F-2	So. Stillwater.....	(k)	12-16-15	Municipal.....	Drilled well 684 ft.....	+	0	Abandonment or construction	Complied with
384	F-2	Watonwan Co. St. James.....	(j)	1-27-14	Municipal.....	2 drilled wells 540 ft.....	+	0	Construction.....	No reply
385	F-2	St. James.....	(n)	1-27-14	Private.....	Drilled well 30 ft.....	+	+	Abandonment.....	Abandoned

TABLE No. 1—Continued
 WATER SUPPLY INVESTIGATIONS, JANUARY 1, 1914—JANUARY 1, 1916

No.	Kind	Locality	Re-quested by	Date	Ownership	Source	Results		Recommendation	Result of Follow-up
							Field	Ana-lytical		
386	F-2	Wilkin Co. Breckenridge.	(j)	3-2-14	Municipal.	Orter Tail river (F.H).	0	0	None	Complied with Complied with
387	F-2		(l)	6-3-15	Municipal.	Orter Tail river (F.H).	0	+	Operation.	
388	F-2		(j)	6-12-14	Municipal.	Drilled well 250 ft.	+	+	New supply.	
389	P-1		(r)	6-10-15	Municipal.	Drilled well.	+	+	Approval.	
390	F-2	Winona Co. Altura.	(q)	9-1-15	Municipal.	Drilled well 300 ft.	+	0	Const., operation.	Work in progress Complied with
391	F-2		(j)	9-22-15	Municipal.	Driven well 19 ft.	+	0	Construction.	
392	F-2		(h)	9-22-15	Municipal.	Drilled well 942 ft.	0	0	None.	
393	F-2		(q)	7-17-14	Company.	Driven well 49 ft.	0	0	None.	
394	F-2		(l)	6-11-15	Municipal.	2 dug wells 38 ft. and 28 ft.	+	+	Const., treatment.	
395	F-2		(l)	6-17-15	Municipal.	2 dug wells 38 ft. and 28 ft.	+	+	Const., environment	
396	F-2	(e)	9-21-15	Municipal.	2 dug wells, 1 drilled well 154 ft.	+	0	Construction.	Work in progress	
397	F-2	Wright Co. Maple Lake.	(j)	1-2-14	Municipal.	Drilled well 44 ft.	0	0	None	Partly complied with Partly complied with
398	F-2		(q)	8-0-15	Municipal.	Lake Waverly.	+	+	Treatment of new source.	
399	F-2	Yellow Medicine Co. Canby.	(j)	7-3-14	Municipal.	Drilled well, 426 ft., dug well 31 ft.	+	0	Const., environment new source.	Partly complied with Complied with
400	F-2		(e)	12-8-15	Municipal.	Dug and drilled 80 ft. and 426 ft.	+	0	Construction.	
401	P-1	Granite Falls.	(r)	7-8-15	Sanatorium Com.	Drilled well.	+	0	Approval.	Complied with Nothing done
402	F-2		(e)	12-7-15	Municipal.	Minnesota river.	+	+	Treatment.	

(FOOTNOTES TO TABLE I)

Kind of investigation:

- F-1 Field investigation, proposed supply.
- F-2 Field investigation, existing supply.
- P-1 Plan examination, proposed construction.
- P-2 Plan examination, existing construction.

Investigation requested by:

- (a) United States Treasury Department.
- (b) United States War Department.
- (c) Governor.
- (d) State Board of Control.
- (e) State Board of Health.
- (f) University of Minnesota.
- (g) County Sanatorium Commissions.
- (h) School Districts.
- (i) Mayors.
- (j) City or Village Councils.
- (k) City or Village Health Boards.
- (l) City or Village Water and Light Commissions.
- (m) Mining Companies.
- (n) Railroad Companies.
- (o) Water companies.
- (p) Construction Companies.
- (q) Private Citizens.
- (r) Consulting Engineers.
- (s) Architects.

Results:

- O Satisfactory.
- X Unsatisfactory.

Source of supply:

- H Supply treated with hypochlorite.
- F Supply treated by filtration.
- S Supply treated by sedimentation.

Summary of Water Supply Investigations—Table I includes information on the water supply investigations made during this biennial period, from January 1, 1914, to January 1, 1916. The following information has been obtained from the classified material found under the various subject headings:

Number and Kind—Four hundred and two investigations on water supplies were made for 263 localities distributed over the entire state as shown on the maps given on pages 224 and 225. The kind of investigations included 32 proposed supplies and 370 existing supplies. The proposed supplies involved field and laboratory work in 11 cases and field work alone in 9 cases; the remaining 12 were plan examinations. The existing supplies required both field and laboratory work in 354 cases and field work alone in 16 cases. The laboratory work on water supplies involved the examination of 1,260 bacteriological, 424 physical, and 424 chemical samples of water.

Requests—The following tabulation shows the source of the requests for investigations:

United States Government:

Treasury Department.....	2
War Department.....	3

State Government:

Governor	4
Board of Control.....	2
Board of Health.....	97
University	1

County Government:

Sanatorium Commissions.....	2
School Districts	27

Municipal Government:

Mayors	3
Councils	24
Health Boards.....	53
Water and Light Commissions.....	18

Companies:	
Mining	54
Railway	77
Water	2
Construction	4
Individuals:	
Private Citizens.....	16
Consulting Engineers.....	10
Architects	3
Total	<u>402</u>

The number of requests demonstrates the fact that government officials, companies, and private citizens are well aware of the importance of this work for the protection of public health. Attention is drawn to the fact that practically every request came from an outside source and was not instigated by this Board. It should be explained that only 12 of the requests classified under State Board of Health were initiated by them, as 85 of these were "follow-up" investigations where the original request came from another party.

In addition to these requests, many were received from individuals desiring information on private water supplies. These were handled by correspondence or by furnishing copies of the bulletin on Farm Water Supplies.

Ownership—In the following tabulation, the ownerships have been classified:

United States Government.....	6
State	4
County	26
Municipal	169
Community	21
Company	173
Private	3
Total	<u>402</u>

This shows clearly that the work is confined almost entirely to water supplies used by a considerable number of people, which are defined as public water supplies. It is apparent that the municipal and company supplies predominate. This is to be expected as the public water supplies of most communities are owned by municipalities or companies.

Sources of Supply—These investigations involved the examination of 477 different sources of water supply, which had considerable variation in regard to their origin.

Underground

Wells—

Dug	119
Bored	2
Drilled	189
Driven	17
Combined	25
Mine shafts, drifts, sumps.....	53
Springs	19

Surface—

Lakes	25
Rivers	26
Creeks	2
Total	<u>477</u>

It is very apparent that the predominating source is the underground supply, the most frequent type being the drilled well. This is to be expected, as underground supplies can be obtained in most sections of the state, and where properly installed, furnish excellent sources of water supply.

Results on Investigations—A digest of the table shows that 370 existing water supplies were investigated and of this number 145, or 39 per cent, were found to be suitable sources of supply in their existing condition. On the other hand, 225, or 61 per cent, were found to be defective and to

require correction before they could be considered safe for public consumption. These results further show that 104, or 46 per cent, of the 225 unsatisfactory supplies were found to be unsafe both by the field investigation and analytical results; in 97, or 43 per cent, the field investigation alone showed the possibility of pollution, while the analytical results at that time were satisfactory; and in 20, or 8 per cent, the analytical results alone indicated the supply to be dangerous for public consumption. It should be noted that had opinions been based on the analytical findings alone, 43 per cent of the defective supplies would have been overlooked. This furnishes further proof of the correctness of the stand taken by the Minnesota State Board of Health in insisting that a field investigation is absolutely essential if a correct opinion is to be offered on the safety of a water supply. The difference between the field investigation and the analytical results is briefly as follows: The analytical results, when properly obtained, will give an accurate idea of the sanitary condition of the water at the particular time the investigation is made and may furnish some information on the past history of the water. The field investigation, on the other hand, should give an accurate idea of the possibilities of present and future pollution of the supply, and afford information on which recommendations can be made for the protection of the supply. Therefore, it is seen that a field and analytical investigation is necessary, and both should be considered in order to give a correct opinion on the potability of a water supply.

The need of sanitary work on water supplies is very forcefully emphasized when it is considered that 61 per cent of all the existing water supplies examined during this period were found to be defective.

Recommendations—In the tabulation of results, the recommendations made on the proposed and existing water supplies have been classified under seven general headings, in order to obtain information on the character of the advice offered. A total of 306 recommendations were made on the supplies investigated:

Recommendation on—	Number.	Percent.
Construction	193	63
Treatment	41	14
Environment	27	9
Abandonment	18	6
Operation	13	4
New source	10	3
Location	4	1
Total	306	100

This tabulation brings out the most apparent general defects in the water supplies investigated. It is noted that the recommendations offered on construction are more numerous than all others combined. From these results it is very apparent that errors are frequently made in the installation of water supplies. This Division is in a position to give advice from a sanitary point of view which will eliminate the possibility of making such errors. This Board urges every municipality in the state to obtain approval on public water supplies before they are installed, for errors are sometimes difficult and costly to correct after the installation has been made.

Some of the pronounced defects noted in water supply investigations are summarized as follows:

The location of an underground supply where it is subject to flooding with surface water during high water periods.

The improper construction of casings and covers, and lack of adequate provision for drainage to prevent pollution with surface water.

The construction of pits around the source of supply at the surface (especially drilled wells), in which all or a part of the pumping equipment is located. It is difficult to prevent surface and waste water from collecting in such pits, thereby endangering the supply.

The connecting of these pits with sewers or drainage systems, thus making it possible for polluted water or sewage to back up into the pit and pollute the supply.

The installation or maintenance of emergency fire connections with water supplies which are known to be polluted.

The use of surface waters without adequate purification, as practically all surface waters are subject to contamination at any time.

The improper construction and operation of water treatment plants.

“Follow-up” Work on Investigations—As outlined in the introduction of this report, investigations which include recommendations are now systematically followed up to determine whether this advice is carried out. The work was begun during the early part of the period, but does not include all of the supplies investigated. The following tabulation shows the progress made in carrying out the recommendations made on 225 of the proposed and existing water supplies:

	No.	Percent.
Recommendations complied with.....	123	54
Recommendations partly complied with.....	35	15
Work in progress.....	17	7
Work authorized.....	4	1
Work under consideration.....	6	2
Work postponed.....	1	0
Supply abandoned.....	14	6
Recommendations not complied with.....	15	6
No replies to inquiries.....	10	4
	225	

An analysis of these results shows that in 54 per cent of the cases the recommendations were entirely complied with, in 34 per cent some effort has been made to carry out the advice, while in 11 per cent no apparent effort was made. These results show that the advice offered on water supplies is being accepted and carried out in a large percentage of the cases investigated. They show a fair rate of progress when it is considered that in many cases public funds must be raised before the work can be undertaken. It should also be remembered that a number of these investigations were made at or near the end of the period, hence the time was short in which to secure results.

ICE SUPPLIES.

Recently this Board discontinued the investigation of ice supplies as a routine procedure and issued the following circular relating to the cutting of ice:

"In the matter of making sanitary investigations of ice supplies, experience over a considerable number of years has failed to demonstrate that ice is an important or frequent factor in the spread of communicable diseases. No epidemics of such diseases due to pollution in ice have been discovered in Minnesota. Moreover, it is known that the vitality of the ordinary disease-producing bacteria in ice seldom exceeds thirty days. Natural ice is harvested in the winter, with the greatest consumption during the following summer months, so that usually the ice has been in storage for a much longer time than is necessary to produce death of the ordinary bacteria. As a general rule, the dangers from ice lie more in the manner in which it is handled during the process of distribution to the consumer than in the source from which it is collected. The following statements concerning ice are quoted from the Public Health Reports of August 7, 1914, issued by the United States Public Health Service. (Page 2073, 1, 2 and 3.):

"1. Clear ice is, of itself, as free from the danger of conveying infectious disease as we need wish.

"2. Dirty or cloudy ice may be dangerous. It should not be placed in water or on food which is to be eaten uncooked.

"3. There may be danger in eating iced foods or using iced drinks if the ice is improperly handled when placed in contact with the food or drink."

"Ice harvested and distributed in a sanitary manner may be considered safe if the following conditions obtain:

"1. Bodies of water as free as possible from pollution should be selected for the ice fields.

"2. The water under the ice should be at least three feet deep and free from suspended material of any description.

"3. Ice fields should not be selected from locations where the surface of the ice may be flooded with polluted material which may subsequently become frozen and form a portion of the cake.

"4. The ice should be clear and free from visible foreign particles.

"5. Before storing, the surface of the ice should be scraped free from snow, soft ice and foreign material.

"6. Special care should be taken during the cutting to exclude any ice polluted by human or animal excreta.

"These are factors for the determination of which expert technical advice is not required. The Minnesota State Board of Health, therefore, does not feel the necessity under ordinary conditions of sending representatives into the field for the purpose of making such investigations."

Prior to the time the routine work on ice supplies was discontinued, 11 investigations had been made. The following summaries cover these investigations:

BLUE EARTH COUNTY.

Lake Crystal—On June 24, 1914, an investigation was undertaken on the ice supply, at the request of the Chicago, St. Paul, Minneapolis & Omaha Railway Company. The field investigation (M) indicated that Lake Crystal was suitable and safe source from which to harvest an ice supply, provided the fields were located as were those of the Chicago, St. Paul, Minneapolis & Omaha Railway during the previous winter.

CARLTON COUNTY.

Cloquet—On May 11, 1914, an investigation was undertaken on the ice supply, at the request of the health officer. This supply was obtained from the north branch of the St. Louis River. The field investigation (M) and analytical results (13573) indicated this ice supply to be suitable for public consumption.

LAKE COUNTY.

Two Harbors—On December 29, 1914, an investigation was undertaken on a portion of the ice supply, at the request of the village clerk. The field investigation (C) showed conditions which were satisfactory from a sanitary aspect, and Flood Bay Pond was recommended as a suitable source from which to cut ice.

MORRISON COUNTY.

Swanville—On January 20, 1914, an investigation was undertaken to determine the suitability of Lake Peppin as a source of ice supply, at the request of the health officer. The field investigation (M) and analytical results (13376) to (13379) showed the lake to be a safe source from which to obtain an ice supply.

MOWER COUNTY.

Austin—On September 9, 1914, an investigation was undertaken (M) on the ice supply of the Hormel Packing Company, at their request. The ice was obtained from the Red Cedar River, from fields located directly opposite the packing plant

of this company. Sanitary conditions in the river at this point were found to be very unsatisfactory and ice cut from these fields could not be considered suitable for public consumption. The analytical results showed the water to be highly polluted at this point.

On December 16, 1914, a second investigation was undertaken on the ice supply of the Hormel Packing Company, at their request. Since the previous investigation, the unsanitary conditions noted in the previous report which related to the company's plant had been very much improved, but conditions for which other property holders were responsible had not been improved. The analytical results (14038 to 14042) showed some improvement in the quality of the water under the ice fields. Sanitary conditions were still considered highly undesirable and ice from this source could not be recommended for use where it would come in contact with food products. It was suggested that ice for this purpose be cut at a point farther up the river.

OLMSTED COUNTY.

Rochester—On September 1, 1915, an investigation was undertaken on the Zumbro River as a source of ice supply, at the request of a citizen. The field data (M) showed that no contamination was entering the river above the dam at the foot of First Street. Storm water sewers were found to enter at most of the streets below this point. Supplies of ice were harvested from the river both above the dam at the foot of First Street and at a considerable distance below this point. Information collected at this time was to the effect that the ice on the latter area was usually flooded with the storm water and sometimes sanitary sewage, which resulted from periods of thawing weather during the winter seasons. To secure accurate data relating to this question, it would be necessary to see conditions as they exist previous to the time this ice was harvested. It was recommended that all ice harvested for general domestic use be taken from that portion of the Zumbro River which is not liable to be flooded by the storm water mentioned.

RAMSEY COUNTY.

New Brighton—On July 20, 1914, an investigation was undertaken on Long Lake as a source of ice supply, at the request of an ice company. The field investigation (M) showed that Long Lake as it existed at the time of this visit would be a fit place from which to harvest an ice supply, although the analytical data (13703 to 13706) showed a limited amount of pollution in the water.

SWIFT COUNTY.

Benson—On January 7, 1915, an investigation was undertaken on the ice supply, at the request of the health officer. The field investigation (W) showed the Chippewa River at this point to be a suitable source from which to collect an ice supply, provided the fields were not extended too far up the river, which would bring them immediately opposite farm buildings located on the banks. The analytical results (14069 and 14070) representing ice and river water, respectively, showed a marked purification brought about by freezing. The analytical results on the ice sample showed it to be satisfactory for public consumption. It was recommended that the ice fields not be extended to a point above 300 feet below the farm buildings mentioned.

WABASHA COUNTY.

Lake City—On January 29, 1914, an investigation was undertaken on the ice supply harvested from Lake Peppin about 100 feet from shore directly opposite the ice house of the Sinclair Brothers Ice Company, at the request of the health officer. The field investigation (W) and analytical results (13385) indicated the ice to be of suitable quality for public consumption.

On the same date, an investigation was undertaken on the ice supply harvested from Lake Peppin near the city pumping station and directly opposite the ice house of Mr. Ole Beckman, at the request of the health officer. The field investigation (W) and analytical results (13384 and 13430) indicated this ice supply to be suitable for public consumption.

TABLE II
ICE SUPPLY INVESTIGATIONS, JANUARY 1, 1914—JANUARY 1, 1916

No.	Kind	Locality	Requested by	Date	Distributor	Source	Result	
							Field	Ana-lytical
1	F-2	Swanville.....	Health officer.....	1-20-14	Company.....	Lake Peppin.....	0	0
2	F-2	Lake City.....	Health officer.....	1-29-14	Company.....	Lake Peppin.....	0	0
3	F-2	Lake City.....	Health officer.....	1-29-14	Individual.....	Lake Peppin.....	0	0
4	F-2	Cloquet.....	Health officer.....	5-11-14	Company.....	St. Louis river.....	0	0
5	F-1	Lake Crystal.....	Railway Company.....	6-24-14	Company.....	Lake Crystal.....	0	0
6	F-1	New Brighton.....	Ice Company.....	7-20-14	Company.....	Long lake.....	0	0
7	F-1	Austin.....	Packing Co.....	9-8-14	Company.....	Red Cedar river.....	+	+
8	F-1	Austin.....	Packing Company.....	12-16-14	Company.....	Red Cedar river.....	+	+
9	F-1	Two Harbors.....	City Clerk.....	12-20-14	Individual.....	Lake Superior.....	0	0
10	F-2	Benson.....	Health Officer.....	1-7-15	Individual.....	Chippewa river.....	0	0
11	F-1	Rochester.....	Citizen.....	9-1-15	Company.....	Zumbro river.....	+	+

Kind of investigation:

- F-1 Field investigation, proposed supply.
F-2 Field investigation, existing supply.

Results:

- 0 Satisfactory.
+ Unsatisfactory.

Summary of Ice Supply Investigations—Table II shows that 11 investigations were made for 9 localities throughout the state. This work involved the examination of 28 bacteriological, 15 physical, and 15 chemical samples of ice and water. The requests came from municipalities, companies, and individuals. Nine separate sources of supply were investigated. In every case the supply was obtained from a river or a lake. The results show that 7 of the 9 sources were satisfactory for public consumption. Samples of ice were examined from 4 sources, and in no case was the ice found to be contaminated. The 2 sources found to be unsatisfactory were so reported on account of environmental conditions.

MILK SUPPLIES.

A pure milk supply is as important as a safe water supply, for milk is used in all communities. This problem is difficult to control on account of the number of sources from which milk is distributed to any municipality. A pure milk supply means cleanliness in production at the dairy, in distribution to the consumer, and in proper care after delivery. Up to the present time the majority of municipalities in this state have paid little attention to their milk supplies. This is doubtless due to the fact that they are not fully aware of the dangers associated with impure milk. In order to appreciate some of these dangers, it must be understood that milk is a most excellent culture medium for the development of bacteria, and this is especially true of certain disease-producing organisms. Milk serves as a medium for the transmission of many communicable diseases in case the product in any way comes in contact with individuals infected with these diseases, or things handled by them. This means that a single case of any one of these diseases among the producers or distributors of the milk may carry the disease to many of the consumers.

The milk supplies of many municipalities throughout the state could be very much improved by passing proper ordinances governing the sale of the product, which should be followed by routine inspections of the dairies and the methods of handling the milk. In order to make the inspection work complete, bacterial counts should be made on the milk produced by the dairies from time to time. The above procedure, together with an educational campaign among the dairymen and a merit system for producers of the best product, would improve the supply in a short time. In the larger cities, the ultimate solution of the milk supply problem in all probability will be municipal pasteurization. This means that all milk distributed for consumption will be passed through plants under proper supervision. Under present conditions, this appears a long way in the future, but with proper adjustment it offers a solution for this problem.

Scope of Work and Conditions Governing Investigations—The Board fully recognizes the importance of aiding municipalities in securing safe milk supplies, but the lack of funds has made the development of the work impossible. Municipalities could be ably assisted by this Division if routine investigations could be made on their milk supplies from time to time. This work should include an investigation of the source and the methods of handling, and a bacterial count on the milk. The laboratory investigation could be carried on by means of a portable field laboratory. The analytical methods used by this Division in milk work are those prescribed by the American Public Health Association, Laboratory Section, 1912.

During this biennial period, the milk supply of the city of Winona was investigated according to the above procedure. A summary of the investigation is as follows:

Winona—This investigation was undertaken at the request of Dr. D. B. Pritchard, the health officer, under instructions of the executive officer of August 3. The investigation was made (W) in order to check up by bacterial counts the efforts of the local authorities at obtaining a fit milk supply. In June, 1908, the city passed an ordinance providing for the inspection of milk, cream, dairies and dairy herds. Since that time, a veterinarian has been employed by the city to see that the provisions of the ordinance are carried out. The inspection of dairies, milk depots, wagons and the making of the various tests on cattle and milk are made by Dr. R. W. Archibald, the present veterinarian. The policy has been to conduct a campaign of education in connection with the inspection work. This has resulted in a marked sanitary improvement in the various stages of milk production. The dairies have been scored from time to time by inspectors from the State Dairy and Food Commission. A summary of the investigation shows very commendable education coupled with careful inspection work in securing a clean milk supply. A study of the temperature results in relation to the bacterial count suggests that a lower bacterial count could be obtained by maintaining a lower temperature during the time of storage at the dairy farm. Attention was called to the fact that the results of this investigation should not be overestimated but that before definite conclusions could be reached regarding any milk supply, regular routine examinations should be made throughout the year.

SEWERAGE SYSTEMS.

The question of sewage disposal must be considered with two purposes in view, one of the protection of the public health, and the other the prevention of a nuisance. The first deals directly with the prevention of disease, while the second deals largely with personal comfort. Sewage, trade wastes, and excreta are not dangerous if properly handled, but if improperly cared for, they may become a menace to the health of an entire community. Every municipality which contemplates the installation of a sewerage system should appreciate the fact that the discharge of sewage into a stream or other body of water is a problem which may affect other communities within and even outside of the state, and should not be undertaken without consultation with the State Board of Health. It is true that there are many cases which are largely of local significance, but even these may affect other individuals in the immediate vicinity, and should not be undertaken without proper information on the subject. This Board is in a position to look upon these problems from both the state and local point of view, as this Division has ample opportunity to study conditions on a large scale and to offer general advice suitable to the individual case. There is no state law at present requiring municipalities to receive the approval of this Board before proceeding to install sewerage systems, but there is a law to prevent the improper disposal of sewage after such installations are put into operation in cases where complaints are made. It is advisable, therefore, to receive the advice and approval of this Board before an incorrect installation is made which may later require changes, probably at an additional and unnecessary cost.

There appears to be a marked indifference on the part of most municipalities throughout the state in regard to the operation of sewerage systems and treatment plants following their installation. Many places have modern systems and disposal plants, which receive practically no attention. This is a wrong practice, for all sewage treatment plants require care and attention at regular intervals. If this is not given, the efficiency of the plant will soon be impaired and in time will become practically useless. Many complaints made regarding alleged nuisances in the vicinity of treatment plants or their outlets are due to improper operation of the plant, and often show a total lack of attention on the part of local authorities.

Scope of Work and Conditions Governing Investigations—The work undertaken on problems relating to sewage disposal throughout the state is limited, as in the case of water supply investigations, on account of the lack of funds.

Investigations are made free of charge on questions relating to the disposal of sewage from public systems so far as the appropriations will permit, excepting as hereafter provided. These investigations include proposed and existing sewerage systems, treatment plants, and points of disposal.

The state law provides that the sewage disposal of public school buildings shall be approved by the State Board of Health. This obligation was imposed without providing the Board with adequate funds to take on this additional function. Therefore, it has been necessary for this Board to require local school boards to pay a portion of the expense involved, i. e., the field expense incurred in making such investigations.

Investigations are not made on private systems, such as the disposal of sewage from private residences, as a routine procedure. This is impossible for the same reasons that private water supplies are not examined as a routine proposition. In order to furnish information to individuals regarding the disposal of sewage and excreta, two bulletins have been prepared which deal with the question of the disposal of sewage from private residences, both by the wet and dry methods. In case a private citizen desires to be assured that the disposal of waste material from his residence is satisfactory, this Board has made a provision allowing such questions to be investigated, provided the individual is willing to pay a portion

of the cost of such an investigation, such cost to include the field expense of the representative who undertakes the work.

The Board may at any time at its own expense order an investigation of any case of improper disposal of sewage in the state in cases which involve the study of disease, and the restrictions mentioned above apply only to routine procedures.

Methods of Investigating Sewerage Systems—The investigation of these problems may include engineering, laboratory, and office work, both in the field and at the division headquarters. The field work nearly always involves sending a trained representative to the locality. In the case of a proposed system, information is obtained on the type of collecting system, the treatment required, if any, and the possible outlets for the sewer. In the case of existing systems, data are collected on all points bearing on the problems involved. This information is collected with a view of making recommendations and offering advice to local communities.

Experimental work has been conducted recently on the various routine laboratory methods already in use for sewage testing. This work has resulted in the selection of a routine procedure which, it is hoped, will be applicable to conditions in this state. These methods must prove applicable for testing the efficiency of treatment plants and for demonstrating the quantity of sewage of a given character that a stream or other body of water will satisfactorily dispose of.

The field investigation, when considered in conjunction with the analytical results, forms a basis on which a comprehensive opinion can be offered on a sewage disposal problem.

Plans on proposed, and changes in existing sewerage systems are examined on request, but approval is not given until a field investigation has been undertaken to obtain exact information concerning local conditions.



MAP No. 3

MAP No. 3

No.	Locality	No. of Investigations	No.	Locality	No. of Investigations
1	Frazee.....	1	30	Warren.....	2
2	Lake Park.....	1	31	Watkins.....	4
3	Blackduck.....	1	32	Milaca.....	1
4	Kelliher.....	3	33	Opstead.....	1
5	Foley.....	2	34	Brewster.....	1
5	Lake Crystal.....	1	35	Round Lake.....	1
7	Vernon Center.....	1	36	Battle Lake.....	1
8	Sleepy Eye.....	2	37	Pipestone.....	1
9	Carlton.....	1	38	New Brighton.....	2
10	Backus.....	1	39	Red Lake Falls.....	1
11	Deerwood.....	1	40	Fairfax.....	1
12	Farmington.....	1	41	Faribault.....	3
13	Wells.....	1	42	Warroad.....	1
14	Spring Valley.....	2	43	Chisholm.....	1
15	Wendell.....	1	44	Duluth.....	1
16	Deephaven.....	1	45	Sibley Location.....	1
17	Glen Lake.....	2	46	Virginia.....	1
18	Hopkins.....	2	47	Kimball.....	1
19	Lake Minnetonka.....	1	48	St. Cloud.....	1
20	Minneapolis.....	1	49	St. Joseph.....	1
21	Caledonia.....	1	50	Chokio.....	1
22	Grand Rapids.....	1	51	Kerkhoven.....	1
23	Park Rapids.....	1	52	Browerville.....	1
24	Willmar.....	1	53	Staples.....	1
25	Northome.....	1	54	Janesville.....	1
26	Dawson.....	1	55	Waseca.....	1
27	New Prague.....	1	56	Breckenridge.....	1
28	Marshall.....	1	57	Lewiston.....	1
29	Tracy.....	1	58	Maple Lake.....	1



MAP No. 4

MAP No. 4

No.	Locality	No. of Investigations	No.	Locality	No. of Investigations
1	Hebron	1	50	Bruno	1
2	Anoka	2	51	Friesland	1
3	Lake Park	1	52	Sandstone	1
4	Blackduck	1	53	Fosston	1
5	Puposky	1	54	Glenwood	1
6	Williams	1	55	Lake Gervais	1
7	Foley	1	56	State Fair	1
8	Graceville	1	57	White Bear	2
9	Odessa	1	58	Lamberton	1
10	Mapleton	1	59	Walnut Grove	2
11	Augusta	1	60	Warroad	1
12	Maynard	1	61	Alpena Location	1
13	Milan	1	62	Cook	1
14	Taylor Falls	1	63	Deacon Location	2
15	Felton	1	64	Duluth	2
16	Deerwood	2	65	Duncan Location	1
17	Claremont	1	66	Genoa Location	4
18	Nelson	2	67	Gilbert	1
19	Delavan	2	68	Glen Location	1
20	Mabel	2	69	Hartley Location	1
21	Wendell	1	70	Leonidas Location	1
22	Columbia Heights	1	71	Monroe Location	1
23	Deephaven	2	72	Morris Location	1
24	Excelsior	1	73	Myers Location	1
25	Groveland	1	74	Nopeming	2
26	Hopkins	2	75	Norman Location	1
27	Bogalusa Location	1	76	Penobscot Location	1
28	Bulgarian Camp	1	77	Pioneer Location	2
29	Coleraine	1	78	Shaw Location	1
30	Deer River	1	79	Sheridan Location	1
31	Marble	1	80	Shiras Location	1
32	Taconite	1	81	Sibley Location	1
33	Atwater	1	82	Soudan Location	1
34	Boyd	2	83	Stephen Location	1
35	New Prague	1	84	Wanless Location	1
36	Balaton	1	85	Belle Plaine	1
37	Glencoe	2	86	Arlington	1
38	Hutchinson	1	87	Morris	1
39	Waubun	1	88	Staples	1
40	Middle River	1	89	Browns Valley	1
41	Strandquist	2	90	Wabasha	2
42	Triumph-Monterey	1	91	Verndale	1
43	Eden Valley	2	92	New Richland	1
44	Princeton	1	93	Waseca	1
45	Kinbrae	2	94	Wolverton	1
46	Worthington	1	95	Lewiston	1
47	Dover	1	96	St. Charles	2
48	Battle Lake	2	97	Maple Lake	1
49	Goodridge	2	98	Granite Falls	1

Summaries of Investigations on Sewerage Systems—The following short summaries have been prepared from reports on investigations of sewerage problems that were made for various localities during this biennial period. These summaries have been arranged by counties and localities:

AITKIN COUNTY.

Hebron—On August 27, 1915, an investigation was undertaken on the sewage disposal from a proposed building for School District No. 75, at the request of the clerk of the school board. It was recommended (C) that a sewage treatment plant consisting of a settling tank of the Imhoff type, a dosing tank and an underground sand filter be constructed, with an outlet into a nearby drainage ditch.

ANOKA COUNTY.

Anoka—On May 10, 1915, plans were examined (C) for a sewage disposal plant for the Franklin public school building, at the request of the architect. The plans showed a settling tank of the Imhoff type, a dosing tank and soil absorption system. The plans were recommended for approval.

On December 28, 1915, an investigation was undertaken, at the request of the consulting engineer, on the proposed sewerage system for the city. At that time four proposed locations for a sewage treatment plant and sewer outlet were investigated (C). It appeared to be the consensus of opinion that an outlet into the Mississippi River would be preferable to one into the Rum River. A place was selected on the point of land between the Rum and Mississippi Rivers as being the most desirable location for the treatment plant.

BECKER COUNTY.

Frazer—On May 5, 1914, an investigation was undertaken on a proposed sewerage system, at the request of the president of the village council. Owing to the peculiar topography of the village, there is no natural outlet for surface water. It was proposed to lay a storm water sewer with a 12-inch outlet to the Otter Tail River. It was recommended (C) that a competent sanitary engineer be employed to design a system of sanitary sewers for the whole village so that the outlet pipe could be laid in the same trench at the same time that the outlet for the storm water sewers is constructed. Since the outlet pipe for either system must be laid at a considerable depth, an ultimate saving would be effected if both pipes could be laid at the same time.

BELTRAMI COUNTY.

Blackduck—On July 7, 1911, a follow-up investigation was undertaken on a sewage treating plant. A previous recommendation regarding the installation of a hypochlorite plant for disinfecting the sewage had not been complied with. Recommendations were made (C) for the construction of a sludge bed and that an inspection manhole and cover be provided for determining the height of the sludge in the sludge well.

On November 2, 1915, another follow-up investigation was undertaken (C) on the sewage treating plant. Difficulty had been encountered in the removal of sludge which did not flow freely from the sludge pipe. It was found that this difficulty was due to the low available head on the sludge pipe and the presence of sand in the sludge well. It was recommended that the sand be removed and that a new sludge pipe be installed. An outfall sewer from the tank to Colburn Creek was also recommended.

Ke'lilier—On January 12, 1914, plans were examined (C) for a sewerage system and sewage treatment plant, at the request of the consulting engineer. The plans showed a system of sanitary sewers with an outlet into a dry run located north of the village. The plans provided for a settling tank of the Imhoff type capable of treating approximately 20,000 gallons of sewage per 24 hours. A sludge bed was provided. The plans were recommended for approval.

On May 25, 1914, a follow-up investigation was made (C) on the sewage treatment plant under construction at this village. The plant was found to be practically completed but the forms had not been removed. It was found that with a few exceptions the work had been done as shown in the plans. The need for hypochlorite treatment was called to the attention of the village authorities.

On July 7, 1914, another investigation was undertaken on the sewage treatment plant at the request of the consulting engineer. This inspection (C) was for the purpose of determining whether or not the plant was ready to be put into operation. It was found that no weir was provided at the outlet end of the tank. The sludge distributing pipe had not been constructed in accordance with the plans, the distributing spout having been omitted. No steps had been taken toward the construction of the hypochlorite plant for treating the tank effluent. Recommendations for the operation of the plant were sent to those in authority.

Lake Julia—On March 11, 1915, plans were examined (C) for a sewage disposal plant for the Beltrami-Koochiching-Hubbard County Sanatorium, at

the request of the consulting engineers. The plans show a small Imhoff tank, from which the effluent was to be conducted directly into Lake Julia, or discharged by means of an automatic siphon intermittently onto an underground gravel and sand filter, the effluent from which would flow on the surface of the ground toward Lake Julia. The plans were recommended for approval.

Williams—On October 11, 1915, an investigation was undertaken relative to the disposal of sewage from the public school building under construction for District No. 91, at the request of the clerk of the school board. It was recommended (C) that a settling tank of the Imhoff type be installed and that the effluent be discharged into an existing tile drain leading to a ravine, the water in which flows toward the Willow River.

BENTON COUNTY.

Foley—On September 4, 1914, plans were examined (C) for a dairy waste purification plant for the Farmers' Co-Operative Creamery Association, at the request of the architect. The plans were recommended for approval.

On December 11, 1914, an investigation was undertaken (C) of the dairy waste treating tank recently constructed for treating the waste from the Farmers' Co-Operative Creamery, at the request of the local health officer. With a few minor exceptions, this plant was found to have been constructed in accordance with the plans approved on September 4, 1914.

On July 21, 1915, plans were examined (C) for a dairy waste treating plant for the Bridgeman-Russell Company's creamery, at the request of the directors of the company. The plans showed a plant similar to that shown by the standard plans of the State Board of Health (File P-11). The waste, after passing through this tank, is to be discharged into a small creek. The plans were recommended for approval.

BIG STONE COUNTY.

Graceville—On July 9, 1915, an investigation (C) was undertaken on sewage disposal at the request of the president of the village council. A new sewerage system to serve a district which could not be reached by the existing system, had been planned. The outlet for this system was to be into East Tokua Lake. It was recommended that the outlet be so arranged that one treating plant could be installed to treat the sewage from both the new sewer system and the existing one.

Odessa—On September 22, 1915, an investigation was undertaken (C) on the disposal of sewage from the school building in District No. 24, Big Stone County, at the request of the president of the school board. It was recommended that a settling tank of the Imhoff type, a dosing tank and soil absorption system be installed and that a competent engineer be employed to prepare the plans and specifications for this work.

BLUE EARTH COUNTY.

Lake Crystal—On August 13, 1914, an investigation was undertaken on a proposed sewerage system, at the request of the mayor. Lake Crystal has no sewerage system, but has a public water supply. It was pointed out (C) that a system of sanitary sewers with purification plants with outlets into Crystal Lake or Lily Lake might be constructed.

Mapleton—On October 26, 1915, an investigation was undertaken (C) on the sewage disposal, at the request of the village attorney. It was found that the village maintained a sewerage system of the semi-combined type, with an outlet into a ditch where the sewage is discharged without treatment. It is proposed to replace the ditch by a tile drain which is to become a part of a comprehensive drainage system. The purpose of this investigation was to advise regarding the treatment necessary in case the sewage was discharged into the tile. It was recommended that a settling tank of the Imhoff type be constructed and that such a tank be so located that, should further treatment be necessary, it could be accomplished without pumping.

Vernon Center—On August 18, 1914, an investigation was undertaken on sewage disposal from a school building, at the request of the chairman of the school board. No sewerage system exists in Vernon Center. It was proposed to construct a septic tank with which the sewage from the school house was to be treated and afterward discharged into an existing tile drain. A set of the State Board of Health standard plans for school house sewage purification plant were left with the chairman of the school board (C) with advice as to its installation.

BROWN COUNTY.

Sleepy Eye—On March 28, 1914, an investigation was undertaken for the purpose of making a general investigation for a sewerage system and giving an address on the same subject to people at Sleepy Eye, at the request of a local physician. It was recommended (B) that a system of separate sewers be installed having an outlet into Sleepy Eye Creek. A settling tank of the Imhoff type was recommended.

On August 12, 1914, plans were examined (B) for a sewerage system and sewage disposal plant for Sleepy Eye, at the request of the consulting engineer. The plans were recommended for approval.

CARLTON COUNTY.

Carlton—On December 30, 1914, an investigation was undertaken on the general sanitary conditions in this village, at the request of a local citizen. Certain recommendations (B) tending to improve the general sanitary conditions in the village were offered.

CASS COUNTY.

Backus—On September 1, 1914, an investigation was undertaken on the sewage disposal plant at the school building in Consolidated School District No. 1, at the request of the treasurer of the school board. Alterations which had recently been made on the building included the installation of toilet rooms and a sewage disposal plant. The effluent from the plant was to be discharged into the soil by means of a concrete lined pit with open bottom. It was pointed out (C) that this method would provide for the disposal of the effluent for a few years, but that eventually clogging would occur and at that time an automatic siphon and tile absorption system would have to be installed.

CARVER COUNTY.

Augusta—On September 13, 1915, an investigation was undertaken (C) on the dairy waste disposal from the Carver County Creamery, at the request of the secretary of the company. The waste from the creamery, after passing through a septic tank was discharged into a small, shallow pond adjacent to the creamery. The waste in this pond was complained of as creating a nuisance. The existing septic tank was of little benefit as a treatment plant. It was recommended that a treating plant similar to that shown by the State Board of Health standard plans (File P-11) be constructed, through which the waste could be passed before discharging into the pond.

CHIPPEWA COUNTY.

Maynard—On November 30, 1915, an investigation was undertaken on the disposal of sewage from the new school building in District No 30, at the request of the school board. Three propositions were considered. The plan which provided for a sewer to Hawk Creek, at which point an Imhoff tank could be installed, was recommended (C) as preferable. This system could be so designed that it would also serve as an outlet for a sewerage system for at least a portion of the village.

Milan—On September 22, 1915, an investigation was undertaken (C) on the question of a sewage disposal plant for the school building in District No. 45, at the request of the clerk of the school board. It was recommended that a plant consisting of an Imhoff tank, a dosing tank and an underground filter be constructed, with an outlet into an existing tile drain, and that a competent engineer be employed to prepare the plans and specifications for this work.

CHISAGO COUNTY.

Taylor's Falls—On August 6, 1915, an investigation was undertaken (C) on the question of providing suitable toilet facilities for the Interstate Park, at the request of the Interstate Park Commissioner. The present park toilets are unsatisfactory and unsafe on account of their proximity to the picnic grounds and eating pavilion. It was recommended that modern toilet facilities be provided. The Interstate Park Commissioner has a plan of constructing a rest pavilion provided with toilet facilities on land near the entrance to the park. The sewerage system which would take care of the sewage from this rest pavilion and also that from a portion of the village of Taylor's Falls was recommended.

CLAY COUNTY.

Felton—On November 10, 1915, an investigation was undertaken on the question of sewage disposal from the school building in District No. 75, at the request of the clerk of the school board. The field investigation (W) showed that the sewage could be disposed of by means of an Imhoff tank, the effluent to be discharged into a ditch at one side of the public road. This drainage system would eventually empty into the Red River. Advice was given concerning the care which should be given in locating the tank.

Sand Beach Lake—On October 1, 1914, an investigation was undertaken on a system of sewage disposal for the Clay-Becker Counties Tuberculosis Sanatorium, at the request of a member of the local sanatorium commission. It was recommended (C) that the sewage from the sanatorium buildings be conducted to a sewage treating plant located near the shore of Sand Beach Lake, the effluent from this treating plant to be discharged into Sand Beach Lake in a prescribed manner.

On May 28, 1915, plans were examined (C) for a sewage disposal system, at the request of the consulting engineers. The plant consists of a tank of the

Imhoff type and an underground gravel and rock filter. The effluent is to be discharged into Sand Beach, or Boyer Lake, under water. The plans were recommended for approval.

CROW WING COUNTY.

Deerwood—On August 31, 1914, an investigation was undertaken on the proposed disposal of sewage from Deerwood into Serpent Lake, at the request of a citizen of Crosby. The Village of Deerwood proposed to construct a sewage disposal plant, discharging its effluent into Serpent Lake. This was objected to by some of the residents of the village of Crosby. The investigation was undertaken (W & C) to determine whether or not the proposed disposal of sewage into Serpent Lake by the village of Deerwood would be detrimental. The field investigation showed that the village of Deerwood could with safety discharge the effluent from their proposed sewerage system and treatment plant into Serpent Lake without endangering the public health, provided the proper care and operation were given the plant. Samples of water were taken from Serpent Lake to show the present sanitary condition of the water in order to have a check on it prior to the discharge of the effluent from the Deerwood plant into the lake.

On January 28, 1915, plans were examined (C) for a sewer system and sewage disposal plant at the request of the mayor. The plans showed a system of sanitary sewers, a screen chamber, Imhoff tank, hypochlorite plant and a cesspool. The plans as a whole were not recommended for approval, although certain portions indicated that the work was done in accordance with good practice. No place of final disposal other than the cesspool was indicated. It is to be noted that the plans were not submitted for approval until the construction of the system was practically completed, thus affording no opportunity for correction of mistakes.

On April 20, 1915, supplementary plants were examined (C) of the sewer system and sewage treatment plant, at the request of the consulting engineer. Certain points of the design not made clear by the plans examined on January 28, 1915, were shown to be satisfactory by these revised plans, with the exception of the disposal into the cesspool.

DAKOTA COUNTY.

Farmington—On August 25, 1914, an investigation was undertaken on a proposed sewerage system, at the request of a member of the Commercial Club. The village was provided with a partial water supply, but no sewerage system. It was proposed to construct a trunk sewer, the outlet to be into the Vermillion River. It was recommended (C) that the sewage carried by the sanitary sewer be treated by sedimentation in an Imhoff tank and disinfected with hypochlorite. Flush tanks were recommended on account of the flat grade.

DODGE COUNTY.

Claremont—On August 31, 1915, an investigation was undertaken (C) on the sewage disposal from the public school building in District No. 58, at the request of the clerk of the school board. The only existing place of disposal for the school sewage is into a tile drain which leads to an outlet into a dry run which empties into the Zumbro River. This drain already receives considerable sewage, and very unsanitary conditions exist below the outlet. The discharge of the school house sewage into the drain would add to the present nuisance. It was recommended that a village sewerage system be constructed with a treatment plant and an outlet into the Zumbro River. Such a system would serve not only the village but also the school.

DOUGLAS COUNTY.

Nelson—On October 14, 1915, an investigation was undertaken on the question of sewage disposal for the public school building in District No. 103, at the request of the clerk of the school board. It was recommended (W) that a settling tank of the Imhoff type be installed, the effluent to be discharged into a tile drain on the adjoining property.

On November 27, 1915, plans were examined (W) for a sewage treating plant at this school building. They showed an Imhoff tank designed according to the standard plans of the State Board of Health. They were recommended for approval.

FARIBAULT COUNTY.

Delavan—On June 1, 1915, an investigation was made (C) regarding a proposed sewerage system for the public school building, at the request of the school board. It was recommended that the village co-operate with the school board and install a sewerage system which would not only take care of the school sewage, but also that from the village.

On August 12, 1915, plans were examined (C) for a sewage treating plant for the village, at the request of the engineers. This plant consists of a tank of the Imhoff type, with an outlet into a tile drain. The plant is to be built by the school board primarily to treat the sewage from the public school building, but it is to be located so that it will be possible to treat the sewage from a portion of the village.

Wells—On June 29, 1914, an investigation was undertaken on the disposal of sewage, at the request of the mayor. It was found (C) that a sewerage system had been designed by a competent engineer in 1899. The design made use of an existing storm sewer and provided for one other combined sewer, one separate sanitary sewer and two separate storm sewers. The outlet of all these systems except the two storm sewers was to be at one point into a sluggish ditch leading to a tributary of the Le Sueur River. This system as designed has been only partially constructed and several alterations from the original plans have been made. It was recommended that a portion of the sewerage system be reconstructed so as to conduct the sewage to out outlet if possible, and there install a sewage treatment plant. It was recommended that this plant consist of a settling tank of the Imhoff type, a percolating filter and resettling tank and a disinfecting plant.

FILLMORE COUNTY.

Mabel—On July 16, 1915, an investigation was undertaken (C) on the sewage disposal from the public school building, at the request of the secretary of the school board. The field investigation showed that cesspools into which the sewage had been previously discharged were inadequate on account of the soil conditions, and it was proposed to run a sewer to a small creek south of the building. It was recommended that the sewage be treated by passage through a tank of the Imhoff type followed by filtration through an underground coarse sand filter.

On September 18, 1915, plans were examined (C) of the sewage treatment plant at the request of the clerk of the school board. The plans show a settling tank of the Imhoff type, the effluent of which is passed through an underground sand and gravel filter before being discharged into a small creek. The plans were recommended for approval.

Spring Valley—On June 3, 1914, an investigation was undertaken (B) on the alleged sewage nuisance at Spring Valley. A small creek runs through the village in a northeastern direction, ultimately draining into the Root River. The flow in this creek is exceedingly variable. It was found that several private sewers and one school sewer were discharged into this creek without treatment, causing a nuisance in time of dry weather. It was recommended that a plan for a sewerage system and disposal plant should be made and construction commenced as soon as possible.

On September 23, 1914, another investigation was undertaken on the question of sewage disposal, at the request of a citizen. Complaint had been made concerning the discharge of the school sewage into Spring Creek. As shown by the previous investigation, no general municipal sewerage system exists in Spring Valley, but several (ten) sewers discharge separately into Spring Creek. The sewer complained of as causing the greatest nuisance was from the high school, which was constructed about a year ago. It was again recommended (C) that all of the present outlets be discontinued and a municipal sewerage system and sewage purification plant constructed. This sewer system should be of the strictly sanitary type.

GRANT COUNTY.

Wendell—On April 3, 1914, an investigation was undertaken on the disposal of waste from the creamery which was about to be constructed, at the request of the president of the Farmers' Co-operative Creamery Association. It was planned to remove the waste from the creamery through a drain tile to an outlet in a ditch along a public highway leading west from the village. The opinion was given (C) that disposal of waste in this manner would probably be the cause of a nuisance and it was recommended that some other method of disposal of the waste be provided, such as an outlet into a creek located east of the village.

On August 19, 1915, an investigation was undertaken (W) on a question of sewage disposal, at the request of the village council. It was found that the sewerage system consisted of a few blocks of storm water sewer which emptied into a slough adjacent to the village. A number of requests had been made to the city council for permission to discharge sanitary sewage into this storm water sewer. The local authorities were advised that a discharge of sanitary sewage into this sewer would cause a nuisance and be dangerous to health in the immediate vicinity. It was recommended that a separate system of sanitary sewers be installed, with an outlet into Mustinka River. The sewage should be passed through an Imhoff tank before being discharged into the river.

HENNEPIN COUNTY.

Columbia Heights—On August 9, 1915, an investigation was undertaken (C) on the disposal of sewage from the public school building in District No. 65, at the request of the clerk of the school board. The plan suggested was approved for temporary use.

Deephaven—On June 11, 1914, an investigation on the question of sewage disposal on the property of Mr. R. Bennett, was undertaken at the request of a citizen. A field investigation (W) showed that immediate danger from the present system was limited, but that steps should be taken to provide a more modern system for future use. Recommendations were offered regarding the type of plant which would be suitable for the disposal of sewage in this particular case.

On August 4, 1915, an investigation was undertaken (C) on the disposal of sewage from this public school building, at the request of the clerk of the school board. It was recommended that a settling tank of the Imhoff type be constructed and that the effluent be discharged either into an arm of St. Albans Bay or upon the surface of the ground.

On November 27, 1915, plans were examined (C) for a sewage disposal plant for this school building, at the request of the consulting architects. The plans showed a tank of the Imhoff type, a dosing tank and underground sand filter. The effluent is to be discharged onto the surface of the ground, with drainage provided toward Lake Minnetonka. The plans were recommended for approval.

Excelsior—On April 10, 1915, plans were examined (C) for a sewage disposal plant for the high school building, at the request of the consulting engineer. The plans showed a plant consisting of an Imhoff tank, percolating filter and resettling tank, capable of treating from 7,000 to 9,000 gallons of sewage per twenty-four hours. The plans were recommended for approval.

Glen Lake—On July 18, 1914, an investigation was undertaken (C) in reference to a proposed sewage disposal plant for the Glen Lake Tuberculosis Sanatorium, at the request of the consulting engineers. Since the institution will probably be enlarged and the quantity of sewage increased in the future, it was recommended that the plant be so designed that its capacity could be increased at not too great an expense. It was recommended that the initial plant consist of a settling tank of the Imhoff type, sludge bed and tile absorption system. A percolating filter could be substituted for the absorption tile system when necessary. The effluent of the plant will discharge into a swamp.

On August 28, 1914, plans were examined (C) for a sewage disposal plant for this institution, at the request of the consulting engineers. The plans show an Imhoff tank, dosing or syphon chamber and a soil distribution tile system with underdrain. They were recommended for approval.

Groveland—On April 13, 1915, plans were examined (C) for a sewage disposal plant for the public school building in District No. 53, at the request of the engineers. The engineers were asked to make certain minor changes in the details of the design, which was done. The plans were then recommended for approval.

Hopkins—On August 28, 1914, plans were examined (C) for a sewage disposal plant for the Minneapolis Threshing Machine Company, at the request of the consulting engineers. The plans as shown consisted of an Imhoff tank, sludge bed and hypochlorite mixing chamber. They were recommended for approval.

On November 27, 1914, an inspection was made (C) of the sewage disposal plant constructed by the Minneapolis Threshing Machine Company, at the request of the consulting engineers. It was found that the tank had been constructed in accordance with the plans approved August 28, 1914. Verbal and written instructions as to operation were given.

On August 25, 1915, an investigation was undertaken (C) on the sewage disposal from the public school building in District No. 19, at the request of the clerk of the school board. There are two school buildings, located close together near the center of the village. One of these was already provided with toilet facilities, the sewage being discharged into a septic tank which had an outlet into a soil absorption system. It was stated that this plant was operating successfully. In view of the agitation for a municipal sewerage system for the village of Hopkins, it was recommended that as little money as possible be expended on the sewage disposal plant for the schools. It was recommended that the sewage from the toilets which would be installed in the building not already provided with toilets be discharged into the existing sewage disposal plant.

On January 4, 1915, an investigation was undertaken (C) to determine the feasibility of a sewerage system and to advise regarding the disposal of sewage, at the request of the village recorder. It was found that a sewerage system was feasible and that an outlet could be obtained into Nine Mile Creek, a tributary of the Minnesota River. It was recommended that an Imhoff tank and disinfection plant be installed. This treatment will probably need to be supplemented by filtration at some future time. The village authorities were advised to employ an engineer to prepare plans for a system, which plans should be submitted to this Board for approval.

Huntington Point, Lake Minnetonka—On September 26, 1914, an investigation was undertaken for the purpose of determining the possible method of disposing of the sewage from a residence at this point, at the request of the owner of the property. It was recommended (C) that a dosing tank and underground filter be constructed with an outlet into Lake Minnetonka.

Minneapolis—On August 8, 1914, an investigation was undertaken of a proposed sewage disposal plant at the Catholic Orphanage, at the request of the contractors. The city sewer being inaccessible, it was proposed to construct a sewage disposal plant to take the place of the method of disposal by means of a cesspool, the overflow from which was onto a low meadow. An Imhoff tank was recommended (C) and a copy of the plans prepared by the State Board of Health showing an Imhoff tank and sludge bed were furnished the company.

HOUSTON COUNTY.

Caledonia—On June 3, 1914, an investigation was made for a proposed sewerage system at the request of the health officer. The village was found to be divided into one large drainage district and one small drainage district. It was recommended (B) that the village employ a competent engineer to design a system of sanitary sewers and the necessary treatment plants.

HUBBARD COUNTY.

Park Rapids—On August 12, 1914, an investigation was undertaken on a proposed sewerage system for this village at the request of the health officer. Plans had been prepared providing for a system of sanitary sewers, a settling tank of the Imhoff type, percolating filter and hypochlorite plant, the effluent to be discharged into the Fish Hook River. It was recommended (B) that the plans be altered to provide for two sewer districts instead of one and for the omission of the percolating filter, the tank treatment being considered sufficient.

ITASCA COUNTY.

Bogalusa Location—Section 4, Township 55, Range 24 West—On June 22, 1915, an investigation was undertaken on the question of excreta and garbage disposal, at the request of the Oliver Iron Mining Company. This is a rather small isolated community with no sewerage system. Privies of the pit type were used. It was recommended (C) that lime be used in the privies. There is no garbage collection system.

Bulgarian Camp—Section 4, Township 55, Range 24 West—On June 22, 1915, an investigation was undertaken on the disposal of excreta and garbage, at the request of the Oliver Iron Mining Company. This is a rather small isolated community with no sewerage system. Privies of the pit type were used. It was recommended (C) that lime be used in the privies. There was no garbage collection system.

Coleraine—On June 22, 1915, an investigation was undertaken on the sewage, excreta and garbage disposal, at the request of the Oliver Iron Mining Company. A general sewerage system of the combined type served practically the entire village. (C) Forty-five of the one hundred and six houses owned by the Oliver Iron Mining Company were found to have sewer connections. Privies of the Canisteco box type were generally in use, and some were seen in rather bad condition. Garbage was collected twice a week. Surface drainage and general sanitary conditions were found to be good.

Deer River—On January 15, 1915, an investigation was undertaken to determine the feasibility of a sewerage system, at the request of the health officer. It was found (C) that, owing to the topography of the ground, a system would be somewhat difficult to obtain without the pumping of the sewage, although this point could not be absolutely determined until more information was at hand regarding surface elevation. Two outlets were considered, one into the Deer River, and the other into a proposed ditch, the former being preferable. In either case, treatment of the sewage was recommended.

Grand Rapids—On December 28, 1914, an investigation was undertaken (C) of the sewage disposal and toilet arrangements at the North Central Experiment Station of the University of Minnesota, at the request of an employe. It was found that the toilet facilities were inadequate, poorly located and improperly constructed. It was recommended that the entire plumbing and toilet system be reconstructed and that a small Imhoff tank be constructed in which the sewage could be treated.

Marble—On June 22, 1915, an investigation was undertaken (C) on sewage, excreta and garbage disposal, at the request of the Oliver Iron Mining Company. A general sewerage system served practically the entire village. Of the sixty-five houses owned by the Oliver Iron Mining Company, nine only have connections with this system. Privies of the Canisteco district box type were in general use. Garbage was collected twice a week. The general condition of streets and alleys was found to be good.

Taconite—On June 22, an investigation was undertaken (C) on sewage, excreta and garbage disposal, at the request of the Oliver Iron Mining Company. A sewer system served but a small portion of the village. Recommendations were offered regarding the type of system to be constructed when the work was undertaken. Garbage was removed twice a week. Privies of the Canisteco District box type were generally in use. Surface drainage was found to be good.

KANDIYOHI COUNTY.

Atwater—On September 24, 1915, an investigation was undertaken (C) in regard to the possibility of installing a sewerage system, at the request of the health officer. Several citizens wished to install septic tanks and discharge the effluent from such tanks into an existing drain tile. This procedure had led to many complaints of nuisances in other cases, and it was not recommended in this case.

It was recommended that a sewerage system of the sanitary type be constructed, with an outlet into a small lake, the sewage being first treated in an Imhoff tank.

Willmar—On August 14, 1911, an investigation was undertaken on the sewage disposal, at the request of a citizen. The sewage was collected by a system of sanitary sewers, passed through a settling tank of the Imhoff type and discharged into a county drainage ditch south of the city. It was found (B) that the nuisance complained of was largely due to stagnant water and decaying vegetation. It was recommended that an engineer be employed to determine the most feasible method of remedying the situation.

KOOCHICHING COUNTY.

Northome—On May 4, 1914, an investigation was undertaken on the question of a proposed sewerage system, at the request of the secretary of the Northome Club. It was recommended (C) that a competent sanitary engineer be employed to prepare plans of a system of sanitary sewers having an outlet into Bartlett Lake. It was recommended that the sewage be passed through a settling tank of the Imhoff type and be treated with hypochlorite before being discharged into the lake.

LAC QUI PARLE COUNTY.

Boyd—On September 2, 1915, an investigation was undertaken (C) on the sewage disposal from the public school building in district No. 86, at the request of the clerk of the school board. It was recommended that a settling tank of the Imhoff type, a dosing tank and an underground filter be constructed, having an outlet into a slough located approximately 300 feet east of the building. It was recommended that the school district employ a competent engineer to prepare the plans for this plant.

On September 28, 1915, plans were examined (C) for a sewage treating plant for this school building, at the request of the architect. The plans showed a tank of the Imhoff type, a dosing tank and underground filter having an outlet into a slough located east of the building. The plans were recommended for approval.

Dawson—On July 3, 1914, an investigation was undertaken on the question of sewage disposal at the Farmers' Co-operative Creamery Company, at the request of the local health officer. The field investigation (W) showed that the company was installing a drain to carry the discharge from a septic tank which had been previously installed to the Lac qui Parle River. It appeared that the dilution brought about by discharging this effluent into the river would obviate the prevailing nuisance.

LE SUEUR COUNTY.

New Prague—On September 24, 1914, an investigation was undertaken on the dairy waste and sewage disposal, at the request of the health officer. It was found (C) that the waste from a local creamery was being discharged into a small creek and creating a nuisance. It was recommended that this dairy waste be treated. It was also recommended that the city of New Prague take steps toward the construction of a system of sanitary sewers and a sewage treatment plant.

On October 20, 1915, plans were examined (C) for a sewage treating plant to be used to treat the sewage from the New Prague Flouring Mill Company, at the request of the owners. The plans showed a tank of the Imhoff type, the effluent from which was to be discharged into a sewer leading to a creek. The plans of the tank were recommended for approval, but approval of the method and place of final disposal was not given.

LYON COUNTY.

Balaton—On August 19, 1915, an investigation was undertaken (C) on the sewage disposal from the public school building in district No. 46, at the request of the school board. There was no municipal sewerage system into which the sewage from this building could be discharged without treatment. It was recommended that the most economical plan would be to construct a municipal sewerage system which would take care not only of the sewage from the school but also that from a portion of the village. Such a system could have an outlet into Lake Yankton, the sewage first being passed through a settling tank of the Imhoff type.

Marshall—On April 22, 1914, an investigation was undertaken on the sewerage and general sanitary conditions in this city, at the request of a member of the city council. Existing sewer systems discharged sewage into Redwood River through two outlets. The presence of several manure piles, garbage, ash heaps and piles of other refuse along the banks of the Redwood River were objectionable from both a sanitary and an aesthetic viewpoint. It was recommended (C) that a sanitary engineer be employed to prepare plans for a system of sanitary sewers which would serve one district which was without adequate sewerage facilities.

Tracy—On August 19, 1914, an investigation was undertaken on the question of sewage disposal, at the request of the health officer. The sewerage system is of the combined type, the outlet being into a dry run which extends northeast from the city, the sewage before it is discharged being passed through an Imhoff tank. A nuisance was complained of and this was found (C) to be due to the fact that the waste from two creameries was being discharged into the sewers. It was recommended that tanks be installed at each creamery for the separate treatment of their waste before the discharge into the sewerage system. It was also recommended that the effluent from the Imhoff tank be treated by means of filtration through a percolating filter followed by a resettling tank and disinfection with hypochlorite.

McLEOD COUNTY.

Glencoe—On May 29, 1915, plans were examined (C) for a sewage treating plant for the city of Glencoe, at the request of the consulting engineer. The plans showed a plant consisting of two units, each having a grit and screen chamber, a tank of the Imhoff type and a sludge bed arranged in parallel. It was the intention to construct but one of these units at that time, the second to be constructed when found necessary. The plans were recommended for approval.

On June 10, 1915, plans were examined (C) for a system of sanitary sewers with an outlet into Buffalo Creek after treatment, at the request of the consulting engineer. The plans of this sewerage system were recommended for approval.

Hutchinson—On October 6, 1915, an investigation was undertaken on the question of sewage disposal from a district in the northwestern portion of the city, at the request of a citizen. Certain residents in this district, which was not provided with a sewerage system, had constructed septic tanks and cesspools and the seepage from these eventually found its way into a mill pond from which ice was cut. This had occasioned considerable alarm among certain citizens who were interested in proper health measures. The opinion was given (C) that, if ice was cut at proper location on the pond, it would not be affected by this seepage. It was recommended that the design originally prepared for a sewerage system be followed in providing sewers for this district.

MAHNOMEN COUNTY.

Waubun—On July 30, 1915, an investigation was undertaken (C) on the sewage disposal from a public school building in district No. 2, at the request of the clerk of the school board. The field investigation showed that the school building in use at that time was to be replaced by a larger building and that two plans for sewage disposal were being discussed: (a) To install a temporary plant; (b) to install a permanent plant which could be later used to dispose of sewage from the new building. The latter method was recommended.

On August 3, 1915, plans were examined (C) for a sewage disposal plant for this school building, at the request of the contractor. The plans consisted of a settling tank of the Imhoff type, a dosing tank, an underground sand and gravel filter, and a soil absorption system. These plans were recommended for approval.

MARSHALL COUNTY.

Middle River—On March 29, 1915, plans were examined (C) for a sewage disposal plant for the public school building in district No. 126, at the request of the architect. The plans showed a septic tank which, with one minor exception, was correct in design. An Imhoff tank, however, was recommended.

Strandquist—On July 29, 1915, an investigation was undertaken (C) on the sewage disposal from the public school building, at the request of the architect. It was recommended that a sewage disposal plant, consisting of a settling tank of the Imhoff type, a sewage lift and a soil absorption system be constructed. If it was found later that the soil absorption system did not operate successfully, an outlet might be obtained into a ditch paralleling the right of way of the Minneapolis, St. Paul & Sault Ste. Marie Railway.

On September 27, 1915, plans were examined (C) for a sewage treating plant for this school building, at the request of the architect. The plans showed a tank of the Imhoff type, the effluent from which was to be passed through an underground filter before being discharged into a drainage ditch. These plans were recommended for approval.

Warren—On June 2, 1914, plans were examined (C) for a sewage treatment plant, at the request of the local engineers. The plans provided for a rearrangement of the sewerage system so that the storm water could be separated from the sanitary sewage. The treatment plant, as shown by the plans, consisted of a sedimentation tank of the Imhoff type, a sludge bed, a sewage lift, a percolating filter, a resedimentation tank of the Imhoff type and a hypochlorite plant and mixing tank. With the exception of certain minor details, the plans were recommended for approval.

On October 15, 1914, plans were examined (C) for a sewage treating plant, at the request of the local health officer. These plans as submitted did not fulfill the requirements previously made by the State Board of Health, and were therefore not recommended for approval.

MARTIN COUNTY.

Triumph-Monterey—On August 19, 1915, an investigation was undertaken (C) on the disposal of sewage from the public school building in district No. 118, at the request of the clerk of the school board. There was no municipal sewerage system into which the sewage from the school might be discharged. A tile drainage system having an outlet into a small creek which flows through a marsh south of the village was the only available outlet for a sewerage system. It was recommended that a settling tank of the Imhoff type be constructed, through which the sewage from the school could be passed before discharging into this tile drain. Owing to the fact that there was considerable ground water flowing in this drain, with which the effluent from the settling tank would be diluted, the construction of an underground filter was not considered necessary.

MEEKER COUNTY.

Watkins—On June 15, 1914, an investigation was undertaken (C) on the disposal of waste from a farmers' co-operative creamery which was under construction, at the request of the health officer. The only available place of disposal for the waste from this building was into a small creek located south of the village. It was recommended that a settling tank be constructed through which the waste could be passed before discharging into the creek. Assurance could not be given that the waste could be made entirely inoffensive by any form of tank treatment.

On July 10, 1914, plans were examined (C) for a dairy waste purification plant at the Farmers' Co-operative Creamery at the request of the company. These plans show a tank of the Imhoff type designed similarly to the tank recommended by the State Board of Health for the treatment of dairy waste. These were recommended for approval with a few additions and corrections.

On November 16, 1914, an inspection was made of the dairy waste treating plant under construction for the Farmers' Co-operative Creamery (C) at the request of the local health officer. It was found that, owing to a miscalculation, the bottom of the tank would have to be lowered $3\frac{1}{2}$ feet in order to obtain the proper capacity.

On December 11, 1914, a second inspection of this plant was made, which indicated that the work was being executed in accordance with the plans.

Eden Valley—On October 1, 1915, an investigation was undertaken to determine the best method of disposing of the sewage from the public school building in District No. 146, at the request of the president of the school board. It was recommended (C) that a settling tank of the Imhoff type, a dosing tank and soil absorption system be constructed.

On October 8, 1915, plans were examined (C) for a sewage disposal plant for this building, at the request of the president of the school board. The plans provided for a settling tank of the Imhoff type, dosing tank and soil absorption system. The plans were recommended for approval.

MILLE LACS COUNTY.

Milaca—On August 4, 1914, an investigation was undertaken on the sewage disposal, at the request of a citizen. It was found (C) that Milaca has a partial system of combined sewers, serving a portion of the village. It was recommended that a system of sanitary sewers for the residence districts be constructed, using so far as possible the existing system.

Opstead—On December 3, 1914, an investigation was made for a sewage disposal system for a proposed public school building for District No. 15, at the request of the chairman of the school board. Two sites were visited (C). One of these sites was much superior to the other from the standpoint of the treatment and disposal of the sewage.

Princeton—On November 19, an investigation was undertaken on the question of sewage disposal for a proposed school building, at the request of the school board. Several sites had been considered (W), one of them being outside the sewered district. Some difficulty would be experienced in connecting this section with the sewerage system. The school board was informed that it would be possible to dispose of the school sewage on the site in question by means of an Imhoff tank, dosing tank and under-ground filter. They were advised to consider the cost of this proposition in comparison with that required to connect with the village sewerage system.

NOBLES COUNTY.

Brewster—On September 29, 1914, plans were examined (C) for a sewage disposal system for a high school building, at the request of the architect. The plans provided for a drainage system and treatment of the sewage by means of a septic tank. The plans were recommended for approval.

Kinbrae—On November 5, 1915, an investigation was undertaken (C) on the disposal of sewage from the public school building at the request of the clerk of the school board. It was recommended that a sewage treating plant, consisting of a settling tank of the Imhoff type and an underground filter, be constructed. The

sewer from the building had been laid at an elevation too high for the successful operation of an underground filter. It was recommended that if at any time in the future a nuisance was created, the sewer from the school building be relaid and the filter constructed.

On November 10, 1915, plans were examined (C) for a sewage disposal plant for this building, at the request of the architect. The plans showed a plant consisting of a settling tank of the Imhoff type, a dosing tank and sand filter, with an outlet into the village tile drainage system. The plans were recommended for approval.

Round Lake—On April 21, 1914, an investigation was undertaken for a proposed sewerage system and disposal plant, at the request of the health officer. An inspection of two existing drain tiles carrying house sewage was made (C). It was recommended that a competent sanitary engineer be employed to design an adequate sewerage system and treatment plant.

Worthington—On June 8, 1915, plans were examined (C) for a sewage disposal plant at the Southwestern Minnesota Sanatorium, at the request of the consulting engineers. The plans provided for a settling tank of the Imhoff type, a dosing tank and underground filter. The plans of the Imhoff tank were recommended for approval. It was recommended that the construction of the dosing tank and filter be postponed until after the institution was in operation and the necessity for such an addition to the treating plant was shown.

OLMSTED COUNTY.

Dover—On December 20, 1915, an investigation was undertaken on the disposal of waste water by means of deep wells, at the request of a citizen. The field investigation (M) showed that two wells were drilled for the purpose of draining cellars. The construction of the wells had not yet been completed at that time. According to the plans of one of the owners, only drainage water from the soil free from surface wastes would be drained into his well. The other owner could not be interviewed at that time. Recommendations were made for such construction as would completely eliminate surface contamination from these wells and also for the installation of a municipal sewerage system.

OTTER TAIL COUNTY.

Battle Lake—On May 14, 1914, an investigation was undertaken on the sewage disposal from the Otter Tail County Sanatorium, at the request of the chairman of the local sanatorium commission. It was found (C) that the sewage was being conducted to a septic tank located approximately 150 feet north of the sanatorium building. The effluent from the septic tank had been discharged into a soil absorption system. Owing to the high ground water level, this system had been unable to absorb the sewage as rapidly as it was discharged into it, and it was causing a nuisance by the backing up of the sewage into the basement of the sanatorium. It was recommended that a new treatment plant be constructed having an outlet into the Otter Tail Lake.

On April 27, 1915, an investigation was undertaken on the sewage disposal at the sanatorium, at the request of a member of the sanatorium commission. It was found (C) that recommendations made at the time of the previous investigation regarding the disposal of the sewage from this building had not been carried out, owing to opposition of certain persons owning land on the shore of Otter Tail Lake, into which it was recommended that the effluent of the treating plant be discharged. The sewage was being pumped onto the surface of the ground at that time. As a temporary expedient, it was recommended that a sand filter be constructed with which the effluent of the septic tank could be treated. Pumping of the sewage would be required.

On December 6, 1915, tentative plans were examined (C) for two methods of sewage disposal to replace the inadequate system in use, at the request of the architects. One system provided for the installation of a sewage treatment plant with an outlet into Otter Tail Lake. The other provided for the installation of sewage ejectors and pumping of the sewage to a filter located over 120 feet west of the building. The first arrangement was recommended for approval.

PENNINGTON COUNTY.

Goodridge—On July 29, 1915, an investigation was undertaken (C) on the sewage disposal from the public school building in District No. 8, at the request of the architect. It was recommended that a sewage treating plant be constructed to consist of a settling tank of the Imhoff type, a sewage lift and a coarse sand filter. The effluent from this plant could be discharged into a ditch.

On September 27, 1915, plans were examined (C) for a sewage treating plant for this school building, at the request of the architect. The plans showed a tank of the Imhoff type, the effluent from which was to be passed through an underground filter before being discharged into a drainage ditch. These plans were recommended for approval.

PINE COUNTY.

Bruno—On July 15, 1915, plans were examined (C) for a sewage disposal plant for the public school building in District No. 51, at the request of the architect. The plans showed a disposal plant consisting of a tank of the septic type divided into two compartments, the effluent from which was to be disposed of into the soil. The plans as filed showed a plant of correct design for one of the septic type. Since a tank of this type is inferior to one of the Imhoff type, the plans were not approved.

Friesland—On July 23, 1915, an investigation was undertaken on the sewage disposal for a new public school building in District No. 35, at the request of the clerk of the school board. It was recommended (C) that a sewage treating plant consisting of a tank of the Imhoff type the effluent from which should be passed through a coarse sand filter, be constructed to treat the sewage from the school building, the effluent from this tank to be discharged onto the surface of the ground in a ravine located near the school.

Sandstone—On February 27, 1915, plans for a system of sanitary sewers were examined (C), at the request of the village recorder. These plans were recommended for approval.

PIPESTONE COUNTY.

Pipestone—On April 22, 1914, an investigation was undertaken on the disposal of sewage from the United States Indian school, at the request of the superintendent. The sewage was discharged at the top of a rocky bluff at a point about a quarter of a mile west of the school buildings. From this point the sewage went in a winding channel to a small creek (Crooked Lake) located about a quarter of a mile from the outlet of the sewer. Crooked Lake has been used as a source of ice supply. It had been proposed to continue the sewer to an outlet into the creek leading from the lake. This proposition was not endorsed unless the sewage first receive very complete purification, owing to the fact that the land around Crooked Lake was used for pasturage. It was recommended (C) that the sewage from the school building be passed through a settling tank of the Imhoff type and treated with hypochlorite. In case the cutting of the ice from this lake is contemplated, very complete purification of the sewage would be necessary.

POLK COUNTY.

Fosston—On June 11, 1915, plans were examined (C) for a sewerage system of the semi-combined type, with an outlet into a ditch, at the request of the consulting engineer. With certain reservations, the plans were recommended for approval.

POPE COUNTY.

Glenwood—On August 14, 1915, an investigation was undertaken (C) on the disposal of sewage, at the request of a citizen. It was found that, owing to neglect in care of the septic tank, feces were being discharged into the lake, endangering the health of the bathers who used the portion of the lake near the sewer outlet. Recommendations were made to relieve the situation temporarily. The conversion of the septic tank into a new Imhoff tank and the disinfection of the tank effluent with hypochlorite was recommended.

RAMSEY COUNTY.

New Brighton—On March 17, 1914, an inspection was made (B) of a broken sewer in this village, at the request of the village recorder. The sewer was located on the property of the Minnesota Belt Line Railway Company, and was used to remove the wastes from six rendering plants. The wastes were escaping through a break in the sewer and flowing into a swamp, creating an alleged nuisance. It was recommended that an engineer be employed to determine the grades in this sewer and the connections to it, and to design a sewer which might be so constructed as to be kept in good condition.

On October 31, 1914, an investigation was undertaken (B) on the disposal of wastes from the rendering plants, at the request of several citizens. Conditions were found to be somewhat improved. The break in the sewer mentioned in the previous report had been repaired. It was advised that the recommendations offered at the time of the previous investigation regarding the relaying of all or a part of the sewer system be carried out. It was also recommended that a treatment plant be constructed at the outlet.

St. Paul—On March 1, 1915, an investigation was undertaken (C) on the sewage disposal at the Bethesda Convalescent Home on Lake Gervais, at the request of an adjoining property holder. It was found that the sewage from this institution, after passing through a septic tank was discharged upon the surface of the ground near a public highway in such a manner that a nuisance might very easily be created. Recommendations were made that an underground filter be constructed, the effluent to be discharged into Lake Gervais in a prescribed manner.

On March 12, 1915, an investigation was undertaken on the sewage disposal for the State Fair Grounds, at the request of the executive officer. It was found

(B) that the sewage was being discharged onto the surface of the ground in such a manner that a nuisance might be created. It was proposed to construct a sewer in co-operation with the city of St. Paul in such a manner that the sewage from this institution would be taken care of. The method proposed was endorsed.

White Bear—On May 26, 1915, a consultation was held regarding the sewage disposal problem, at the request of the local health officer. There was no municipal sewerage system. The local authorities were advised (C) that instead of continuing the construction of private cesspools, septic tanks and privies, it would be better and more economical in the long run to construct a municipal sewerage system with a sewage treating plant and outlet into White Bear Lake.

On October 2, 1915, an investigation was undertaken on the method of sewage disposal at the St. Paul Automobile Club, at the request of the executive officer. The field data (M) showed that septic tanks were used for collecting the sewage, which was pumped later to dry wells near the ground surface. The overflow from the septic tanks connects with a pipe used to carry water to Goose Lake. Recommendations were made that extreme care be exercised to prevent the discharge of sewage through the overflow into Goose Lake.

RED LAKE COUNTY.

Red Lake Falls—On April 2, 1914, an investigation was undertaken on the disposal of sewage from a public school building located in Block 14, Champagne and Dows Addition, at the request of a local physician. The sewage from this building was passed through a septic tank and discharged into the soil through a system of absorption tile. It was feared that the disposal of sewage in this manner might be the cause of contaminating certain private wells in the vicinity. It was found (C) that the danger of wells being contaminated from this source was very remote. The opinion was given that the soil conditions were not favorable to the disposal of school house sewage in this manner for any considerable length of time. It was recommended that, if trouble occurred through the clogging of the soil, a sewer be constructed to the Clear Water River, which could be later incorporated as a part of the municipal sewerage system.

REDWOOD COUNTY.

Lamberton—On August 18, 1915, an investigation was made (C) on the disposal of sewage from the new public school building in District No. 31, at the request of the clerk of the school board. It was recommended that a sanitary sewerage system be designed for the village, a part of which could be constructed at this time to care for the school sewage. If this could not be done, a sewage treating plant could be constructed at the school and the effluent discharged into an existing tile drainage system.

Walnut Grove—On September 1, 1915, an investigation was undertaken (C) on the sewage disposal from the public school building in District No. 33, at the request of the clerk of the school board. There was no municipal sewerage system into which the sewage from this building could be discharged. A tile drain led from the building a distance of approximately three-fourths of a mile to an outlet into a small ditch. This drain provided the only possible means of sewage disposal for the school. It was recommended that a settling tank of the Imhoff type and an underground coarse sand filter, through which the school house sewage could be passed before being discharged into this drain, be installed.

On December 6, 1915, plans were examined (C) for a sewage treatment plant for this school building. The plans showed a settling tank of the Imhoff type, a dosing tank and underground sand filter, with an outlet into the existing tile drain. The plans were recommended for approval.

RENVILLE COUNTY.

Fairfax—On August 7, 1914, an investigation was undertaken on the proposed system of sewage disposal for a high school building, at the request of the contractor. It was proposed to construct a septic tank for the disposal of the sewage from the high school building and to discharge the effluent into a ditch located from 400 to 500 feet from the school building. Standard State Board of Health general plans for a disposal plant for public school buildings were left with the contractor (C) and the school board. A further inspection was recommended before the plant was finally completed.

RICE COUNTY.

Faribault—On April 13, 1914, plans were examined (B) of a sewage treatment plant for the School for the Feeble Minded, at the request of the consulting engineer. The plans provided for a grit chamber, settling tank of the Imhoff type and sludge bed. The effluent from this plant was to be discharged into the Straight River. The plans with certain exceptions regarding details were recommended for approval.

On May 18, 1914, plans were examined (C) at the request of the consulting engineer for a sewage treatment plant for Grand View Cottage, School of the Feeble Minded. The plans provided for a settling tank of the Imhoff type of a

size sufficient to treat sewage at the rate of 18,000 gallons per 24 hours, a sludge bed, percolating filter and a re-settling tank. The final disposal of the sewage was to be into Straight River. Certain recommendations were offered regarding the design of the percolating filter. With these exceptions, the plans of the treatment plant as filed were recommended for approval.

On November 4, 1914, an inspection was made of the sewage treating plant recently constructed at the Faribault School for the Feeble Minded (C). It was found that the screen chamber, Imhoff tank and sludge bed had been constructed in accordance with plans previously passed on by the State Board of Health. It was recommended that an hypochlorite plant and mixing chamber be constructed at once in order that they might be ready to operate by spring.

ROSEAU COUNTY.

Warroad—On July 15, 1914, plans were examined (C) for a system of sanitary sewers and a sewage treatment plant, at the request of the consulting engineer. The sewerage system provided sewerage for but a small portion of the village. The sewage was to be passed through a settling tank of the Imhoff type elevated by means of a water ejector and discharged into the Warroad River at a point above the water works intake. The plans of the sewerage system and the Imhoff tank were recommended for approval. The discharge of the sewage above the source of water supply was not recommended for approval.

On December 17, 1915, an investigation was undertaken on sewerage and drainage conditions in the village, at the request of the governor. This work was undertaken to determine the effect that certain proposed levels in the Lake of the Woods would have on the maintenance and operation of these systems, and also on general sanitary conditions and the public health. It was found (C) that considerable annoyance had been experienced on account of the high ground water level, causing damp basements. It was the opinion of this division that the maintenance of the proposed regulated levels will affect the operation of the sewerage and drainage systems only so far as they will increase the length of time and the height to which it will be necessary to pump the sewage. Proper water proofing and drainage would remedy the unsatisfactory conditions in basements to a large extent. The maintenance of the proposed levels should have little effect upon the public health.

ST. LOUIS COUNTY.

Alpena Location—(Section 5, Township 58, Range 17 West)—On June 26, 1915, an investigation was undertaken (C) on the sewage disposal, at the request of the Oliver Iron Mining Company. There were no dwellings at this location. The sewage from the dry house was disposed of into a cesspool.

Chisholm—On October 6, 1914, an investigation was undertaken (W-C) to make a study of the sanitary conditions of Longyear Lake, into which the sewage of the village of Chisholm was discharged after passing through the sewage treatment plant which was recently installed. Samples of water were collected (13821 to 13826) in different parts of the lake. This investigation was not reported, as this work was to be continued over a considerable period of time and a report given whenever the final results indicated the necessity of the same.

Cook—On October 13, 1915, an investigation was undertaken relative to the disposal of sewage for the public school building in District No. 41, at the request of the clerk of the school board. It was recommended (C) that a settling tank of the Imhoff type be installed and that the effluent be conducted to an outlet into Little Fork River.

Deacon Location—(Section 13, Township 58, Range 18 West)—On June 26, 1915, an investigation was undertaken on the disposal of sewage and excreta, at the request of the Oliver Iron Mining Company. The location consisted of the usual mine buildings and a boarding house. Pit type privies were in use.

Duluth—On November 7, 1914, an investigation was undertaken on a sewage disposal plant at the St. Louis County Poor Farm, at the request of the executive officer. This plant originally consisted of an Imhoff tank, a dosing chamber and percolating filter. The tops of the partition walls in the tank separating the upper from the lower compartments had been knocked out, thus converting it into an ordinary septic tank. The plant had not been given the attention necessary for satisfactory operation. It was recommended (B) that it be rebuilt in accordance with the original plans and given regular and intelligent attention.

On August 26, 1915, an investigation was undertaken (C) on the sewage disposal plant at the St. Louis County Poor Farm, at the request of the clerk of the Board of Poor Commissioners. It was found that the existing plant was inadequate and in a very poor state of operation. It was recommended that an entirely new plant be constructed and that the Board employ a competent engineer to prepare these plans and supervise the construction.

On October 25, 1915, plans were examined (C) for a sewage disposal plant for this institution, at the request of the consulting engineer. The plans showed a tank of the Imhoff type and a sludge bed. They were recommended for approval.

Duncan Location—(Section 27, Township 58, Range 20 West)—On June 24, 1915, an investigation was undertaken (C) on the disposal of sewage and excreta, at the request of the Oliver Iron Mining Company. The location consisted of a "dry house" and two dwellings. The dry house was very modern and complete.

Genoa Location—(Section 34, Township 58, Range 17 West)—On June 25, 1915, an investigation was undertaken (C) on the disposal of sewage, excreta and garbage, at the request of the Oliver Iron Mining Company. Of the sixty houses on the location, nine house sewers were connected to a sewerage system which discharged into a ditch leading to Ely Lake. Since the water supply for the village of Gilbert was to be obtained from Ely Lake, it was recommended that a sewage treating plant be installed to treat not only the sewage from the location, but also that from the school building in Independent School District No. 18. Privies of the pit type were in use generally. The garbage was collected at least twice a week.

On September 28, 1915, plans were examined (W) for a sewage disposal plant, at the request of the Oliver Iron Mining Company. The plant consisted of a settling tank of the Imhoff type and a sludge bed. The effluent from the tank was to be discharged into an open ditch, which eventually emptied into Ely Lake. The plans were recommended for approval, with the exception that there should be a slight change in the trough leading from the tank to the sludge bed.

On September 28, 1915, plans were examined (W) for a sewage disposal plant for the school building at Independent School District No. 18, St. Louis county, at the request of the Oliver Iron Mining Company. The plant consisted of a settling tank of the Imhoff type and a sludge bed. The effluent from the tank was to be discharged into an open ditch, which eventually emptied into Ely Lake. The plans were recommended for approval, with the exception that there should be a slight change in the trough leading from the tank to the sludge bed.

On October 22, 1915, plans were examined (C) for a sewage treating plant for the Genoa Location and a public school building, at the request of the Oliver Iron Mining Company. The plans showed a tank of the Imhoff type. They were recommended for approval.

Gilbert—On April 14, 1915, plans were examined (C) for a sewage disposal plant for the filtration plant, at the request of the Oliver Iron Mining Company. The plans showed a settling tank of the septic type, similar to that shown in the bulletin on sewage disposal in unsewered districts. The effluent was to be disposed of by means of a tile absorption system laid in sand and gravel. The plans were recommended for approval.

Glen Location—(Section 29, Township 58, Range 20 West)—On June 24, 1915, an investigation was undertaken (C) on the disposal of sewage, excreta and garbage, at the request of the Oliver Iron Mining Company. Of the fifty houses owned by the company on the location, eight had sewer connections. Privies of the pit type were in general use. The garbage was collected once a week. The streets and alleys were found to be fairly clean.

Hartley—(Section 23, Township 58, Range 20 West)—On June 24, 1915, an investigation was undertaken (C) on the disposal of sewage, garbage and excreta, at the request of the Oliver Iron Mining Company. Of the forty-five houses owned by the company, all but a very few are provided with privies of the pit type. The garbage was collected once a week. Surface drainage was found to be good.

Leonidas Location—(Section 36, Township 58, Range 18 West)—On June 25, 1915, an investigation was undertaken (C) on the disposal of sewage, garbage and excreta, at the request of the Oliver Iron Mining Company. There were twenty-five houses and a school at the location, but only one house and the school were provided with sewer connections. Privies of the pit type were in general use. The garbage was collected at least twice a week. The streets and alleys were reasonably clean.

Monroe Location—(Section 28, Township 58, Range 20 West)—On June 24, 1915, an investigation was undertaken on the disposal of sewage, excreta and garbage, at the request of the Oliver Iron Mining Company. Twenty of the seventy houses owned by the Company had sewer connections. The remainder were provided with privies of the pit type. Garbage was collected once a week.

Morris Location—(Section 31, Township 58, Range 20 West)—On June 23, 1915, an investigation was undertaken (C) on the disposal of sewage, excreta and garbage, at the request of the Oliver Iron Mining Company. Seven of the thirty houses belonging to the company had sewers which discharged into cesspools. The others were provided with privies of the pit type. The garbage was collected twice a week. The streets and alleys were found to be reasonably clean.

Myers Location—(Section 22, Township 58, Range 20 West)—On June 24, 1915, an investigation was undertaken (C) on the disposal of sewage, excreta and garbage, at the request of the Oliver Iron Mining Company. Of the twenty-five houses owned by the company, three had sewer connections. Privies of the pit type were in general use.

Nopeming—On November 10, 1915, an investigation was undertaken on the new sewage treatment plant at the Nopeming Sanatorium, at the request of the local superintendent. It was found (W) that the plant consisted of an Imhoff tank and sludge bed. The effluent was to be discharged onto the hillside, where the

sewage was emptied from the cesspool which was still in use. This sewage entered a creek, which belongs to the drainage system of Mission Creek and St. Louis River. A conference was held with the superintendent and consulting engineer regarding experimental work on the plant, with a view of determining whether or not further treatment would be required.

On November 11, 1915, plans were examined (C) for a sewage treating plant, at the request of the superintendent. The plans showed a tank of the Imhoff type having a capacity of between 18,000 and 20,000 gallons, and a sludge bed. The plans were recommended for approval.

Norman Location—(Section 9, Township 58, Range 17 West)—On June 25, 1915, an investigation was undertaken on the disposal of sewage and excreta, at the request of the Oliver Iron Mining Company. There were no dwellings. A closet of the pit type was provided for use of the men working in the mine.

Penobscot Location (Sec. 21, Twp. 57, R. 21 W.)—On June 23, 1915, an investigation was undertaken (C) on the disposal of sewage, excreta and garbage, at the request of the Oliver Iron Mining Company. Privies of the pit type were generally in use. Of the seventy-five houses owned by the company, ten had sewer connections to a sewerage system which served a portion of the location. The garbage was collected three times a week. The streets and alleys were found to be reasonably clean.

Pioneer Location (City of Ely)—This location is adjacent to the city of Ely. On June 27, 1915, an investigation was undertaken (C) on the sewage, excreta and garbage, at the request of the Oliver Iron Mining Company. There was no sewerage system. An extension of the sewerage system which would serve this location was contemplated. The privies in use were of the removable box type. The garbage collection was done by the city of Ely.

On December 14, 1915, plans were examined (C) for a sewage treatment plant for this location, at the request of the Oliver Iron Mining Company. The plans showed a tank of the septic type. The effluent was to be discharged into Long Lake. With a few minor suggestions, the plans were recommended for approval.

Shaw Location (Sec. 8, Twp. 58, R. 17 W.)—On June 26, 1915, an investigation was undertaken (C) on the disposal of sewage, excreta and garbage, at the request of the Oliver Iron Mining Company. There was no sewerage system. Privies of the small removable box type were in general use. An extension of the Virginia sewer system, which would serve this location, was contemplated. A very excellent collection system of garbage, slops and ashes was in operation.

Sheridan Location (Sec. 3, Twp. 57, R. 21 W.)—On June 23, 1915, an investigation was undertaken (C) on the disposal of sewage, excreta and garbage, at the request of the Oliver Iron Mining Company. There was no sewerage system. Privies of the small removable box type were in general use. The garbage was collected twice a week. The surface drainage and the general condition of the streets and alleys was found to be good.

Shiras Location (Sec. 16, Twp. 58, R. 19 W.)—On June 26, 1915, an investigation was undertaken (C) on the disposal of sewage, at the request of the Oliver Iron Mining Company. There were no dwellings. The sewage from the dry house was discharged into a mine ditch.

Sibley Location (Sec. 26, Twp. 63, R. 12W)—On October 14, 1914, plans were examined (C) for a sewage treating plant for treating the sewage from toilets at the mines on the Sibley Location, at the request of the Oliver Iron Mining Company. These plans were recommended for approval.

On June 27, 1915, an investigation was undertaken (C) on the disposal of sewage and excreta, at the request of the Oliver Iron Mining Company. The dwellings were provided with privies of the large removable box type, the contents of which was removed twice a year. The sewage from the dry house passed through a septic tank, the effluent from which was discharged into Shagawa Lake.

Soudan Location (Sec. 27, Twp. 62, R. 15W)—On June 27, 1915, an investigation was undertaken (C) on the disposal of sewage, excreta and garbage, at the request of the Oliver Iron Mining Company. There was no sewerage system. Privies of the pit type were used. There was no regular garbage collection system.

Stephens Location (Sec. 25, Twp. 59, R. 15 W.)—On June 27, 1915, an investigation was undertaken (C) on the disposal of sewage, excreta and garbage, at the request of the Oliver Iron Mining Company. The population was about one hundred. There was no sewerage system. Privies of the removable box type were provided. Some of these were found to be in a rather bad condition.

Virginia—On October 9, 1914, an investigation was undertaken (C) to study the condition of Manganika Lake, on permission from the executive officer. At the time of this investigation, the sewage was being discharged untreated into the lake. A purification plant was being constructed and this investigation will be continued after it has been put into operation, to show the change in the quality of the water brought about by such an installation. (Samples 13827-13832). A report on the final results will be made in due time.

Wanless Location (Sec. 16, Twp. 58, R. 19 W.)—On June 26, 1915, an investigation was undertaken (C) on the disposal of sewage, at the request of the Oliver Iron Mining Company. There were no dwelling houses. The sewage from the dry house was discharged into a mine ditch.

SCOTT COUNTY.

Belle Plaine—On December 2, 1915, plans were examined (C) for a sewerage system, at the request of the village clerk. The plans provided for a system of sanitary sewers with an outlet into the Minnesota River, into which the sewage was to be discharged without treatment. The plans were recommended for approval, with the provision that if any treatment of the sewage should become necessary at some time, an adequate treatment plant would be installed.

SIBLEY COUNTY.

Arlington—On July 19, 1915, an investigation was undertaken (C) on the sewage disposal for a public school building for district No. 69, at the request of the president of the school board. The building is located in the village of Arlington. There was no municipal sewerage system. It was recommended that the sewage from this building be passed through a settling tank of the Imhoff type, which treatment should be followed by filtration through an underground coarse sand filter, the effluent from which could be discharged into an existing tile drain which has an outlet into High Island creek.

STEARNS COUNTY.

Kimball—On July 14, 1914, plans were examined (C) for a sewage disposal plant for this school, at the request of the consulting engineers. Certain recommendations were offered regarding the location of the main drain leading from the building. The plans of the settling tank, dosing tank and tile absorption system were recommended for approval.

St. Cloud—On May 18, 1914, plans were examined (C) for a sewage treatment plant to treat the sewage from a toilet at the stone quarry of the state reformatory, at the request of the consulting engineers. The treatment plant, as shown by the plans, consisted of a settling tank of the Imhoff type, having a rated capacity of approximately 18,000 gallons per 24 hours, a sludge bed and a percolating filter. The plans of the Imhoff tank with one minor exception were recommended for approval. It was recommended that the design of the percolating filter and resettling tank be postponed until the Imhoff tank was in operation and the flow of sewage known.

St. Joseph—On June 15, 1914, an investigation was undertaken, at the request of a farmer living in the vicinity of the disposal of sewage from St. Benedict's College. It was found (C) that sewage from this institution was discharged into a small pond which had an outlet into a second small pond which in turn discharged into Watab River. It was also found that creamery waste from a St. Joseph creamery was being discharged into this pond. The disposal of the sewage and creamery waste was alleged to be the cause of the nuisance. The bones of two dead, unburied horses were found in the vicinity. A slaughter house was located nearby. It was recommended that a competent sanitary engineer be employed to prepare plans of an adequate sewage treatment plant and a separate dairy waste treatment plant. The suggestion was made that possibly an outlet could be obtained directly into the Watab River which would be preferable to the present outlet into the ponds.

STEVENS COUNTY.

Chokio—On November 25, 1914, an investigation was undertaken (C) on the disposal of sewage, at the request of the village recorder. It was found that drains originally laid to remove water in basements were being used to remove kitchen and other wastes. So far as could be learned, no closets were connected with these drains. These drains discharge into a county ditch, and nuisances have been created near the outlet which, being near a public highway, constituted a violation of the Minnesota public health laws. The village authorities were so advised. It was recommended that a proper sewerage system be installed.

Morris—On September 24, 1915, an investigation was undertaken (C) regarding the sewage disposal from the state agricultural school, at the request of a local citizen. It was found that the system under construction was largely a drainage system, and, while it would provide for the removal of the effluent from the septic tank, the method of disposal would in no way injure the property of the complainant.

SWIFT COUNTY.

Kerkhoven—On November 24, 1914, an investigation was undertaken on the disposal of sewage from the McKinley school, at the request of a citizen. It was found (C) that the sewage was being disposed of in a generally satisfactory manner.

TODD COUNTY.

Browerville—On October 8, 1914, an investigation was undertaken (C) on the disposal of sewage from a school building, at the request of the clerk of the local school board. It was found that trouble was being experienced and some nuisance created on account of the inability of a soil absorption system to take care of the sewage discharged into it from the sewage settling tank. An underground sand filter through which the sewage can be passed was recommended as a temporary expedient until such time as a municipal sewage system can be constructed. The effluent from the underground sand filter was to be discharged into a system of surface water drains already in use.

Staples—On June 2, 1914, plans were examined (C) for a sewage disposal plant for this city at the request of the consulting engineer. The plans provided for a screen, a settling tank of the Imhoff type with a reversible flow of sewage, a sludge bed and dosing tank. It was recommended that the dosing tank as shown by the plans be omitted and that provision be made for the disinfection of the tank effluent with hypochlorite or liquid chlorine. With these exceptions, the plans were recommended for approval.

On November 3, 1915, an investigation was undertaken (C) on this sewage treating plant, which is of the reversible flow type. It was found to be in a neglected condition. Certain recommendations were offered regarding slight changes in some of the pipes, baffles, etc. It was recommended that the building over the plant be painted and the broken windows repaired. The plans must receive regular and intelligent attention in order to operate successfully.

TRAVERSE COUNTY.

Browns Valley—On March 6, 1915, an investigation was undertaken regarding the possibilities of constructing a municipal sewerage system, at the request of the chairman of the appropriations committee of the House of Representatives. It was found (C) that, owing to the channel of the Little Minnesota River below Browns Valley being inadequate to carry off the surplus water, floods had occurred at various times, creating conditions which are a serious menace to the health of the community. It was recommended that the proposition of deepening, straightening and widening the channel of the Little Minnesota River so that it will adequately carry off the flood waters, be recommended for approval. This river improvement must be completed before an adequate sewerage system can be operated successfully in Browns Valley.

WABASHA COUNTY.

Wabasha—On August 31, 1915, an investigation of a public nuisance was undertaken (C), at the request of the president of the local woman's club. The field investigation showed that human wastes were being drained to the gutter along Main street. This waste material was the result of improper methods of disposal existing in the rear of buildings at this point. Owners of these properties had failed to install the proper devices for disposing of these wastes. It was recommended that steps be taken to install a city sewerage system in order that the present unsanitary conditions in Wabasha may be eliminated.

On September 30, 1915, plans were examined (C) for a sewage treating plant and disposal plant for the Wabasha County Tuberculosis Sanatorium, at the request of the consulting architects. The plans showed a settling tank of the Imhoff type, sludge bed, dosing tank and underground filter. They were recommended for approval.

WADENA COUNTY.

Verndale—On September 30, 1915, plans were examined (W) for a sewage disposal plant for the public school building in District No. 5, at the request of the consulting architect. These plans showed a sewage disposal plant which consisted of an Imhoff tank, a dosing tank and an underground filter. The final disposal of the sewage was to be into the soil. The plans were recommended for approval.

WADENA COUNTY.

Janesville—On November 4, 1914, an investigation was undertaken (C) for a sewerage system, at the request of the village council. It was found that the topography naturally divides the village into two sewer districts. It was recommended that a system of sanitary sewers be installed with an outlet into a creek located southwest of the village. Treatment of the sewage was considered necessary.

New Richland—On August 9, 1915, an investigation was undertaken on the disposal of sewage at the request of the county attorney. The field investigation (M) showed that many private and some semi-public drains, a large number of which carry sanitary sewage, were emptied into a small open stream which has a very limited flow. In times of freshet, it is said to spread over the entire area of low land where it flows through the village. Numerous complaints were heard concerning a disagreeable odor arising during dry seasons. It was recommended that

the village install a sanitary sewerage system and that the sewage be passed through an Imhoff tank before being discharged into the creek below the village.

Waseca—On September 15, 1914, an investigation was undertaken (C) on the question of sewage disposal, at the request of the health officer. The sewage, which was collected by a system of sanitary sewers was passed through a tank of the septic type and discharged into a ditch leading to Clear Lake. The disposal of sewage in this manner was said to be creating a nuisance. It was found that a nuisance did exist in the ditch and in the portion of the lake immediately adjacent to the ditch outlet. It was the opinion of this Division that the odors existing in the main body of the lake were due to vegetable growths rather than the sewage. It was recommended that the septic tank be converted into a tank of the Imhoff type, that the outlet pipe be extended to Clear Lake and that the sewage be disinfected.

On October 11, 1915, an investigation was undertaken on the question of sewage disposal, at the request of the sewer committee of the city council. Two features were investigated (C & W) (1) the feasibility of two projects under consideration for the future disposal of sewage, and (2) the operation of the present sewage treating plant. The two projects were (1) to install a pumping station near the site of the present septic tank for the purpose of pumping the effluent into Rice Lake, and (2) to pump the same sewage in a southerly direction to an outlet into the Le Sueur River. The field and analytical investigations on the present sewage treating plant showed conditions which were practically identical with those found at the time of the previous investigation, September 15, 1914, except that the quantity of sewage had increased. (Samples 14457-14464). Of the two projects proposed, it was recommended that (2) be preferred unless adequate treatment was provided before the sewage was discharged into Rice Lake.

WILKIN COUNTY.

Breckenridge—On May 7, 1914, an investigation was undertaken (C) on the proposed sewerage system for a certain district located south of the Great Northern Railway, at the request of the city clerk. Tentative plans had been prepared for two alternate systems of the combined type. It was recommended that a strictly sanitary system of sewers be constructed instead of the proposed combined system and that a storm sewer be laid where necessary to remove the surface water.

Wolverton—On August 13, 1915, an investigation was undertaken (C) on the sewerage system and sewage disposal plant, at the request of a member of the village council. A sanitary sewer, which would provide sewerage facilities for a school building in District No. 31 and for the village, with an outlet into a ravine leading to the Red River of the North, was endorsed. It was recommended that a treating plant consisting of a small Imhoff tank and filter be installed. The village authorities were advised to employ an engineer to prepare the plans and specifications before the work was undertaken.

WINONA COUNTY.

Lewiston—On November 19, 1914, an investigation was undertaken (C) on the disposal of sewage from the public school building in District No. 22, at the request of the health officer. The sewage at that time was found to be discharging into a large cesspool which had been giving trouble on account of the inability of the soil to absorb the water, thereby causing the sewage to back up into the basement fixtures. It was recommended that the present cesspool be disinfected with chloride of lime, then emptied and cleaned, and the bottom scraped and spaded, so that it would be able to take care of the sewage until spring, when a new system of disposal could be constructed.

On August 2, 1915, plans were examined (C) for a sewage disposal plant for the school building in District No. 22, at the request of the consulting engineer. The plans showed a settling tank of the Imhoff type, the effluent from which was to be discharged into a soil absorption cesspool. If found at some future time that this cesspool is incapable of taking care of the sewage, it will be possible to construct a dosing tank and an underground coarse sand filter through which the effluent from the Imhoff tank may be passed and finally disposed of onto the surface of the ground. The plans were recommended for approval.

St. Charles—On September 22, 1915, an investigation was undertaken on sewage disposal from the public school building, at the request of the school board. The field investigation (W) showed that the present method of excreta and sewage disposal consisted of outdoor toilets and a cesspool located on school property. The school board was advised to install an Imhoff tank, dosing tank and underground sand and gravel filter, the effluent from this plant to be discharged into the present cesspool. They were also advised to submit final plans of the sewage disposal system for approval by this Board.

On December 20, 1915, an investigation was undertaken at the request of the health officer on the disposal of sewage by draining into a drilled well. The field investigation (M) showed that the well in question was only drilled to a depth of 26 feet and that the process of drilling was merely a variation from the usual method of blasting away rock in order to reach the sand stratum at this point. It appeared that no unusual condition had arisen in the construction of this well

for the disposal of sewage. Recommendations were made for the installation of a municipal sewerage system as outlined in the report of a previous investigation made on September 22, 1915.

WRIGHT COUNTY.

Maple Lake—On August 3, 1914, an investigation was undertaken on the disposal of sewage, at the request of the president of the village council. It was found (C) that the sewage was discharged without purification into a ditch located between the public highway and the Minneapolis, St. Paul and Sault Ste. Marie Railway. It was found that a considerable nuisance might be caused unless treatment of the sewage was undertaken. Certain complications arose through the existence of a creamery. It was recommended that the creamery install a separate plant for treating its waste before the discharge into the sewer. A recommendation was made for the construction of a sewage disposal plant for the village.

On October 4, 1915, plans were examined (C) for a sewage treating plant, at the request of the engineer. The plant consisted of a screen and grit chamber, settling tank of the Imhoff type, and a sludge bed. The plans were recommended for approval.

YELLOW MEDICINE COUNTY.

Granite Falls—On July 20, 1915, plans were examined (C) for a sewerage system for the Chippewa, Lac qui Parle, Yellow Medicine and Renville Counties Sanatorium, at the request of the engineers. The plans showed a system of the sanitary type. They were recommended for approval.

TABLE No. III
SEWERAGE SYSTEM INVESTIGATIONS, JANUARY 1, 1914—JANUARY 1, 1916

No.	Kind	Locality	Re-quested by	Date	Ownership	Type of System	Treatment	Discharged Into	Recommendations	Result of Follow-up
1	F-1	Aitkin Co. Hebron	(k)	8-27-15	School dist. 75.	Sanitary	Imhoff tank, dosing tank filter	Drainage ditch	System, treatment	Work in progress
2	F-1	Anoka Co. Anoka	(r)	5-10-15	School board	Sanitary	Imhoff tank	Soil absorption	None	Plans submitted
3	F-1	Anoka Co. Anoka	(q)	12-28-15	Municipal	Sanitary	Imhoff tank	Mississippi	Location, treatment	Plans submitted
4	F-1	Becker Co. Frazee	(k)	5-5-14	Municipal	Storm and sanitary	None	Otter Tail river	System	Not complied with
5	F-2	Beltrami Co. Blackduck	(d)	7-7-14	Municipal	Sanitary	Imhoff tank	Blackduck cr.k.	Construction	Partly complied with
6	F-2	Blackduck	(d)	11-1-15	Municipal	Sanitary	Sereen, Imhoff tank, sludge bed	Blackduck cr.k.	Construction and operation	Authorized
7	P-1	Kelliher	(q)	1-12-14	Municipal	Sanitary	Imhoff tank, sludge bed	Pond	None	Partly complied with
8	F-2	Kelliher	(d)	5-24-14	Municipal	Sanitary	Imhoff tank sludge bed	Dry run	Const. treatment	Partly complied with
9	F-2	Kelliher	(q)	7-7-14	Municipal	Sanitary	Imhoff tank	Dry run	Treatment, operation	Partly complied with
10	P-1	Lake Julia	(q)	3-11-15	Sanat'm Com.	Sanitary	Imhoff tank	Lake Julia	None	Work in progress
11	F-1	Williams	(i)	10-14-15	School dist. 91.	Sanitary	Imhoff tank	Ravine	System treatment	Work in progress
12	P-1	Benton Co. Foley	(q)	9-4-14	Company	Creamery sewer	Modified Imhoff tank	Creek	Approval	Complied with
13	F-2	Foley	(l)	12-11-14	Company	Creamery sewer	Modified Imhoff tank	Creek	Construction	Complied with
14	P-1	Foley	(r)	7-21-15	Company	Creamery sewer	Settling tank	Creek	None	Complied with
15	F-1	Big Stone Co. Graceville	(k)	7-9-15	Municipal	Combined	None	East Tokna Bay	System, treatment	Partly complied with
16	F-1	Odessa	(i)	9-22-15	School dist. 24.	Sanitary	Imhoff tank, dosing tank	Soil	System, treatment	No reply
17	F-2	Blue Earth Co. Lake Crystal	(i)	8-13-14	Municipal	Drain tile	None	Crystal Lake	System, treatment	Nothing done
18	F-2	Mapleton	(p)	10-26-15	Municipal	Semi-combined	None	Ditch	Treatment	Plans submitted
19	F-1	Vernon Center	(i)	8-18-14	Municipal	Sanitary	Septic tank	Rapidan river	System, treatment	Not followed up

TABLE No. III—Continued
SEWERAGE SYSTEM INVESTIGATIONS, JANUARY 1, 1914—JANUARY 1, 1916

No. Kind	Locality	Re-quested by	Date	Ownership	Type of System	Treatment	Discharged Into	Recommendations	Result of Follow-up
20	Brown Co.		3-28-14	Municipal	Separate	Imhoff tank	Creek	System, treatment	Plans submitted
21	P-1 Sleepy Eye	(p)	8-12-14	Municipal	Sanitary	Imhoff tank	Creek	None	Not followed up
22	F-1 Carlton	(p)	12-30-14					Management	Not followed up
23	F-2 Cass Co.	(i)	9-1-14	School board	Sanitary	Septic tank	Soil	Construction	Complied with
24	F-2 Carver Co.	(n)	9-13-15	Company	Sanitary	Old septic tank	Pond	System, treatment	Complied with
25	F-1 Chippewa Co.	(i)	11-30-15	School dist. 30	Sanitary	Imhoff tank, dosing tank, sand filter	Hawk creek	System & treatment	No reply
26	F-1 Milan	(i)	9-22-15	School dist. 45	Sanitary	Imhoff tank, dosing tank and filter	Drain tile	System and treatment	Complied with
27	F-1 Chisago Co.	(e)	8-6-15		Sanitary	Imhoff tank	St. Croix river	System and treatment	Nothing done
28	F-1 Interstate Park	(f)	10-1-14	Clay-Becker Co.	Sanitary	Imhoff tank	Sand Beach lake	System and treatment	Plans submitted
29	P-1 Sand Beach Lake	(q)	5-28-15	Clay-Becker Co.	Sanitary	Imhoff tank	Sand Beach lake	None	Work in progress
30	F-1 Clay Co.	(i)	11-16-15	School dist 75	Sanitary	Imhoff tank	Ditch	System and treatment	Work in progress
31	F-1 Crow Wing Co.	(p)	8-31-14	Municipal	Sanitary	Imhoff tank, disinfection	Serpent lake	Treatment, operation	
32	P-2 Deerwood	(p)	1-28-15	Municipal	Sanitary	Screen, Imhoff tank, disinfection	Cesspool	Not approved	
33	P-2 Deerwood	(q)	4-19-15	Municipal	Sanitary	Screen, Imhoff tank, disinfection	Cesspool	None	
34	F-1 Dakota Co.	(p)	8-25-14	Municipal	Separate	Imhoff tank, disinfection	Vermillion river	System and treatment	No replies
35	F-1 Dodge Co.	(i)	8-31-15	Municipal	Sanitary	Imhoff tank	Zumbro river	System and treatment	Under consideration

TABLE No. III—Continued
SEWERAGE SYSTEM INVESTIGATIONS, JANUARY 1, 1914—JANUARY 1, 1916

No.	Kind	Locality	Re-quest- ed by	Date	Ownership	Type of System	Treatment	Discharged Into	Recommendations	Result of Follow-up
36	F-1	Douglas Co.	(i)	10-14-15	School dist. 103.	Sanitary...	Imhoff tank.	Drain tile.....	System and treatment.	Plans submitted
37	P-1	Nelson.....	(a)	11-27-15	School dist 103.	Sanitary...	Imhoff tank.	Drain tile.....	None.....	
38	F-1	Faribault Co.	(i)	6-1-15	School dist.....	Sanitary...	Imhoff tank, filter.....	Drain tile.....	System and treatment.	Plans submitted
39	P-1	Delavan.....	(a)	8-12-15	School dist.....	Sanitary...	Imhoff tank.....	Drain tile.....	None.....	No replies
40	F-2	Wells.....	(p)	6-29-14	Municipal.....	Combined.....	None.....	Ditch.....	Const. and treatment.	
41	F-1	Fillmore Co.	(i)	7-10-15	School district..	Sanitary...	Imhoff tank, dosing tank, sand filter.....	Creek.....	System and treatment.	Plans submitted
42	P-1	Mabel.....	(i)	9-18-15	School district..	Sanitary...	Imhoff tank, dosing tank, sand filter.....	Creek.....	None.....	
43	F-2	Spring Valley.....	(p)	6-3-14	Private.....	Severally sanitary.....	None.....	Creek.....	System and treatment.	Nothing done
44	F-2	Spring Valley.....	(p)	9-23-14	Private.....	Severally sanitary.....	None.....	Creek.....	System and treatment.	No replies
45	F-2	Grant Co.	(m)	4-3-14	Creamery Assn.	Dairy waste	None.....	Ground.....	System.....	Not followed up
46	F-2	Wendell.....	(f)	8-19-15	Municipal.....	Storm.....	None.....	Slough.....	System and treatment.	Nothing done
47	F-1	Hennepin Co.	(i)	8-9-15	School dist 65..	Sanitary...	None.....	Cesspool.....	System.....	Complied with
48	F-2	Columbia Hts....	(p)	6-11-14	Private.....	Sanitary...	None.....	Cesspool.....	Treatment.....	Not followed
49	F-1	Deephaven.....	(i)	8-4-15	School district..	Sanitary...	Imhoff tank, dosing tank and filter.....	Lake Minnetonka	System and treatment.	Plans submitted
50	P-1	Deephaven.....	(r)	11-27-15	School district..	Sanitary...	Imhoff tank, dosing tank and filter.....	Ground surface.	None.....	
51	P-1	Excelsior.....	(a)	4-10-15	School district..	Sanitary...	Imhoff tank, percolat- ing filter and re- setting tank.....	Crystal Bay....	None.....	
52	F-1	Glen Lake.....	(a)	7-18-14	Hennepin Co.	Sanitary...	Imhoff tank, sludge bed	Swamp.....	System and treatment.	Plans submitted
53	P-1	Glen Lake.....	(a)	8-28-14	Hennepin Co.	Sanitary...	Imhoff tank, sludge bed	Ground surface.	None.....	
54	P-1	Groveland.....	(a)	4-14-15	San. Com.... School district..	Sanitary... Sanitary...	Septic tank, dosing tank.....	Soil.....	None.....	

TABLE No. III—Continued
SEWERAGE SYSTEM INVESTIGATIONS, JANUARY 1, 1914, JANUARY—1, 1916

No. Kind	Locality	Re-quested by	Date	Ownership	Type of System	Treatment	Discharged Into	Recommendations	Result of Follow-up
55	Hennepin Co.—Cont.								
F-1	Hopkins.....	(q)	8-28-14	Private.....	Sanitary.....	Imhoff tank, sludge bed	Ditch.....	None.....	
F-2	Hopkins.....	(q)	11-27-14	Private.....	Sanitary.....	Imhoff tank.....	Ditch.....	Operation.....	Complied with
F-1	Hopkins.....	(k)	1-5-15	Municipal.....	Sanitary.....	Imhoff tank, disinfection, percolating filter, etc.	Creek.....	System and treatment.	Under consideration
58	F-1 Hopkins.....	(i)	8-25-15	School district.....	Sanitary.....	Septic tank.....	Soil absorption system.....	System and treatment.	Complied with
59	F-1 Huntington Point.	(p)	9-26-14	Private.....	Sanitary.....	Septic tank, sand filter, dosing tank.....	Lake Minnetonka	System and treatment.	Not followed up
60	F-1 Minneapolis.....	(p)	8-8-14	Catholic Orphanage	Sanitary.....	Imhoff tank, absorption system.....	Meadow.....	Treatment.....	Nothing done
61	F-1 Houston Co.	(l)	6-3-14	Municipal.....	Sanitary.....	.....	.....	System.....	Under consideration
62	F-1 Hubbard Co. Park Rapids.....	(l)	8-12-14	Municipal.....	Sanitary.....	Imhoff tank.....	Fish Hook river	System and treatment.	Nothing done
63	F-2 Itasca Co. Bogalusa Location	(m)	6-22-15	Mining Co.....	None.....	.....	.....	None.....	
64	F-2 Bulgarian Camp..	(m)	6-22-15	Mining Co.....	None.....	.....	.....	None.....	
65	F-2 Coleraine.....	(m)	6-22-15	Municipal.....	Sanitary.....	Septic tanks.....	Trout Lake.....	None.....	
66	F-1 Deer River.....	(l)	1-15-15	Municipal.....	Sanitary.....	Imhoff tank.....	Deer river.....	System and treatment.	Nothing done
67	F-2 Grand Rapids.....	(p)	12-28-14	State.....	Sanitary.....	Cesspool.....	Prairie river.....	Const., treatment.....	Partly complied with
68	F-2 Marble.....	(m)	6-22-15	Municipal.....	Septi-combined.	None.....	Mud Lake.....	None.....	
69	F-2 Taconite.....	(m)	6-22-15	Municipal.....	Sanitary.....	None.....	Mine ditch.....	System and treatment.	
70	F-1 Kandiyohi Co.	(l)	9-24-15	Municipal.....	Sanitary.....	Imhoff tank.....	Lake.....	System and treatment.	Under consideration
71	F-2 Willmar.....	(p)	8-14-14	Municipal.....	Sanitary.....	Imhoff tank.....	Ditch.....	Operation.....	Not followed up
72	F-1 Koochieng Co. Northome.....	(p)	5-4-14	Municipal.....	Sanitary.....	Imhoff tank, disinfection.....	Bartlett lake.....	System and treatment.	Complied with

TABLE No. III—Continued
SEWERAGE SYSTEM INVESTIGATIONS, JANUARY 1, 1914—JANUARY 1, 1916

No.	Kind	Locality	Re-quested by	Date	Ownership	Type of System	Treatment	Discharged Into	Recommendations	Result of Follow-up
73	F-1	Lac qui Parle Co. Boyd	(i)	9-2-15	School dist. 86.	Sanitary	Imhoff tank, dosing tank, filter.	Slough	System and treatment.	Plans submitted
74	P-1	Boyd	(r)	9-28-15	School dist. 86.	Sanitary	Imhoff tank, dosing tank, filter.	Slough	None	None
75	F-2	Dawson	(l)	7-9-14	Creamery Assn	Sanitary	None	Lac qui Parle river	None	None
76	F-2	Le Sueur Co. New Prague	(l)	9-24-14	Creamery Assn.	Dairy waste	None	Creek	System and treatment.	Nothing done
77	P-1	New Prague	(o)	10-20-15	Milling Co.	Sanitary	Imhoff tank	Creek	None	None
78	F-1	Lyon Co. Balaton	(i)	8-19-15	School dist. 46.	Sanitary	Imhoff tank, dosing tank and filter.	Tile drain	System and treatment.	Postponed
79	F-2	Marshall	(k)	4-22-14	Municipal	Combined	None	Redwood river	Construction.	Nothing done
80	F-2	Tracy	(l)	8-19-14	Municipal	Combined	Imhoff tank	Dry run	Treatment.	Partly complied with
81	P-1	McLeod Co. Glencoe	(q)	5-29-15	Municipal	Sanitary	Imhoff tanks sludge beds	Buffalo creek.	None	None
82	P-1	Glencoe	(q)	6-10-15	Municipal	Sanitary	None	Buffalo creek.	None	None
83	F-2	Hutchinson	(p)	10-6-15	Municipal	Sanitary	None	Crow river	Construction.	Work in progress
84	F-1	Mahnomen Co. Waubun	(i)	7-30-15	School dist. 2.	Sanitary	Imhoff tank, dosing tank and filter.	Absorbent well.	System and treatment.	Plans submitted
85	P-1	Waubun	(i)	8-3-15	School dist. 2.	Sanitary	Imhoff tank, dosing tank and filter.	Absorbent well.	None	None
86	P-1	Marshall Co. Middle River	(r)	3-29-15	School dist. 126.	Sanitary	Septic tank	Middle river	None	None
87	F-1	Strandquist	(r)	7-29-15	School dist. 65.	Sanitary	Imhoff tank	Soil	System and treatment.	Plans submitted
88	P-1	Strandquist	(r)	9-28-15	School dist. 65.	Sanitary	Imhoff tank, dosing tank and filter.	Ditch	None	None
89	P-1	Warren	(q)	6-2-14	Municipal	Combined	Imhoff tank, filter, re-settling tank and disinfection.	Snake river	None	None

TABLE No. III—Continued
SEWERAGE SYSTEM INVESTIGATIONS, JANUARY 1, 1914—JANUARY 1, 1916

No.	Kind	Locality	Re-quested by	Date	Ownership	Type of System	Treatment	Discharged Into	Recommendations	Result of Follow-up
90	P-1	Marshall Co.—Cont. Warren.....	(q)	10-15-14	Municipal.....	Combined.	Imhoff tank, disinfection.....	Snake river.....	Not approved.....	
91	F-1	Martin Co. Triumph-Montgomery	(i)	8-19-15	School dist. 118	Sanitary.....	Imhoff tank.....	Tile drain.....	System and treatment.	No replies
92	F-2	Meeker Co. Watkins.....	(l)	6-15-14	Creamery Assn.	Drain tile.	None.....	Creek.....	System and treatment.	Plans submitted
93	P-1	Watkins.....	(m)	7-10-14	Creamery Assn.	Dairy waste	Imhoff tank.....	Creek.....	None.....	Plans submitted
94	F-2	Watkins.....	(l)	11-10-14	Creamery Assn.	Dairy waste	Imhoff tank.....	Creek.....	Construction.....	Complied with
95	F-2	Watkins.....	(l)	12-4-14	Creamery Assn.	Dairy waste	Imhoff tank.....	Creek.....	None.....	Plans submitted
96	F-1	Eden Valley.....	(l)	10-1-15	School dist. 146	Sanitary.....	Imhoff tank, dosing tank	Soil.....	System and treatment.	Plans submitted
97	F-1	Eden Valley.....	(i)	10-8-15	School dist. 146	Sanitary.....	Imhoff tank, dosing tank	Soil.....	None.....	
98	F-2	Mille lacs Co. Milaca.....	(p)	8-4-14	Municipal.....	Combined.	None.....	Rum river.....	System.....	Nothing done
99	F-1	Opstead.....	(i)	12-3-14	School dist. 15.	Sanitary.....	Imhoff tank.....	Ground.....	System and treatment.	Postponed
100	F-1	Princeton.....	(i)	11-19-15	School district..	Sanitary.....	Imhoff tank and filter.	Ground.....	System and treatment.	Postponed
101	P-1	Nobles Co. Brewster.....	(r)	9-29-14	School district..	Sanitary.....	Septic tank.....	Tile drain.....	None.....	Plans submitted
102	P-2	Kinbrae.....	(r)	11-5-15	School district..	Tile.	None.....	Clear lake.....	System and treatment.	
103	P-1	Kinbrae.....	(r)	11-10-15	School district..	Sanitary.....	Imhoff tank, dosing tank and filter.....	Clear lake.....	None.....	Plans submitted
104	F-2	Round Lake.....	(l)	4-21-14	Municipal.....	Tile drains.	None.....	Clear lake.....	System and treatment.	Nothing done
105	P-1	Worthington.....	(q)	6-9-15	S. W. Minn. Tub. Assn....	Sanitary.....	Imhoff tank, dosing tank and filter.....	Ground.....	System and treatment.	Nothing done
106	F-2	Olmsted Co. Dover.....	(p)	12-20-15	Private.....	Deep well for draining.	None.....	Rock stratum.....	Const. and system.....	Nothing done
107	F-2	Otter Tail Co. Battle Lake.....	(f)	5-14-14	Senat. Com....	Sanitary.....	Septic tank.....	Soil.....	System and treatment.	Under consideration
108	F-2	Battle Lake.....	(f)	4-27-15	Senat. Com....	Sanitary.....	Septic tank.....	Ground.....	Treatment.....	Under consideration
109	P-1	Battle Lake.....	(r)	12-6-15	Senat. Com....	Sanitary.....	Imhoff tank, disinfection.....	Otter Tail lake.	Location.....	Under consideration

TABLE No. III—Continued
SEWERAGE SYSTEM INVESTIGATIONS, JANUARY 1, 1914—JANUARY 1, 1916

No. Kind	Locality	Re-quested by	Date	Ownership	Type of System	Treatment	Discharged Into	Recommendations	Result of Follow-up
110	Pennington Co.	(r)	7-29-15	School dist. 8.	Sanitary...	Imhoff tank and filter.	Ditch.....	System and treatment.	Plans submitted
111	F-1 Goodridge..... F-1 Goodridge.....	(f)	9-28-15	School dist. 8.	Sanitary...	Imhoff tank, dosing tank and filter.....	Ditch.....	None.....	
112	Pine Co.	(r)	7-15-15	School dist. 54.	Sanitary...	Septic tank.....	Soil.....	Not approved.....	
113	F-1 Bruno..... F-1 Friesland.....	(i)	7-23-15	School dist. 35.	Sanitary...	Imhoff tank, dosing tank and filter.....	Ground surface. Kettle river.....	System and treatment. None.....	No reply
114	F-1 Sandstone..... Pipestone Co.	(k)	2-27-15	Municipal.....	Sanitary...	None.....			
115	F-2 Pipestone..... Polk Co.	(a)	4-22-14	U. S. Govt.....	Sanitary...	None.....	Crooked lake.....	Treatment.....	Nothing done
116	F-1 Fosston..... Pope Co.	(q)	6-11-15	Municipal.....	Semi-combined.....	None.....	Drain.....	None.....	
117	F-2 Glenwood..... Ramsey Co.	(p)	8-14-15	Municipal.....	Sanitary...	Septic tank.....	Lk. Minnewaska	Const. and treatment..	Partly complied with
118	F-2 Lake Gervais..... F-2 New Brighton.....	(p)	3-1-15 3-17-14	Bethesda Hos- pital..... Private.....	Sanitary... Sanitary...	Septic tank..... None.....	Ditch..... Swamp.....	Treatment..... Operation and treat- ment.....	Complied with Nothing done
120	F-2 New Brighton..... F-2 Fair Grounds..... F-1 White Bear..... F-2 White Bear.....	(p) (d) (l) (d)	10-31-14 3-12-15 5-26-15 10-2-15	Private..... State Fair Assn. Municipal..... St. Paul Auto Club.....	Sanitary... Separate... Sanitary... Sanitary...	None..... None..... Imhoff tank..... Septic tank.....	Stank lake..... Ground surface. White Bear lk. Soil.....	Const. and treatment... Construction..... System and treatment. Operation.....	Nothing done Complied with Nothing done
124	F-2 Red Lake Co. Red Lake Falls..... Redwood Co.	(p)	4-2-14	School district..	Sanitary...	Septic tank.....	Soil.....	Construction.....	Not followed
125	F-1 Lamberton..... F-1 Walnut Grove..... F-1 Walnut Grove.....	(i) (i) (q)	8-18-15 9-1-15 12-7-15	School dist. 31. School dist. 33. School dist. 33.	Sanitary... Sanitary... Sanitary...	Imhoff tank, dosing tank and filter... Imhoff tank and filter... Imhoff tank and filter.	Drain..... Drain tile..... Drain tile.....	System and treatment. System and treatment. None.....	Complied with Plans submitted

TABLE No. III—Continued*
SEWERAGE SYSTEM INVESTIGATIONS, JANUARY 1, 1914—JANUARY 1, 1916

No.	Kind	Locality	Re-quested by	Date	Ownership	Type of System	Treatment	Discharged Into	Recommendations	Result of Follow-up
128	F-1	Renville Co. Fairfax.....	(q)	8-7-14	School district.	Sanitary...	Septic tank, absorption system.....	Ditch.....	Construction.....	Compiled sith
129	P-1	Rice Co. Faribault.....	(q)	4-13-14	State.....	Semi-combined.....	Screen, Imhoff tank.....	Straight river..	None.....	
130	P-1	Faribault.....	(q)	5-18-14	State.....	Sanitary.....	Imhoff tank filter, settling tank.....	Straight river..	None.....	
131	F-2	Faribault.....	(q)	11-4-14	State.....	Sanitary.....	Screen, Imhoff tank.....	Straight river..	Treatment.....	Not complied with
132	P-1	Roseau Co. Warroad.....	(q)	7-15-14	Municipal.....	Sanitary.....	Imhoff tank, disinfection.....	Warroad river..	None.....	
133	F-2	Warroad.....	(c)	12-17-15	Municipal.....	Sanitary.....	Imhoff tank.....	Warroad river..	None.....	
134	F-2	St. Louis Co. Alpena Location..	(m)	6-26-15	Mining Co.....	Sanitary.....	None.....	Cesspool.....	None.....	
135	F-2	Chisholm.....	(d)	10-6-14	Municipal.....	Sanitary.....	Imhoff tank filter, settling tank.....	Longyear lake..	None.....	
136	F-1	Cook.....	(i)	10-3-15	School dist. 41..	Sanitary.....	Imhoff tank.....	Little Fork riv.	System and treatment.	
137	F-2	Deacon Location..	(m)	6-26-15	Mining Co.....	None.....	Imhoff tank filter, disinfection.....	Creek.....	None.....	
138	F-2	Duluth.....	(d)	11-7-14	Poor Comm'rs.	Sanitary.....	Imhoff tank, dosing tank and filter..	Creek.....	Const. and operation..	Nothing done
139	F-2	Duluth.....	(h)	8-26-15	Poor Comm'rs.	Sanitary.....	Imhoff tank, dosing tank and filter..	Dry run.....	Construction.....	Plans submitted
140	P-1	Duluth.....	(q)	10-25-15	Poor Comm'rs.	Sanitary.....	Imhoff tank.....	Dry run.....	None.....	
141	F-2	Duncan Location..	(m)	6-24-15	Mining Co.....	Sanitary.....	None.....	Mine ditch.....	None.....	
142	F-2	Genoa Location.....	(m)	6-25-15	Mining Co.....	Sanitary.....	None.....	Mine ditch.....	System and treatment.	
143	P-1	Genoa Location.....	(g)	9-27-15	School dist. 18..	Sanitary.....	Imhoff tank.....	Ditch.....	None.....	
144	P-1	Genoa Location.....	(m)	9-27-15	Mining Co.....	Sanitary.....	Imhoff tank.....	Ditch.....	None.....	
145	P-1	Genoa Location.....	(m)	10-22-15	Mining Co.....	Sanitary.....	Imhoff tank.....	Creek.....	None.....	
146	P-1	Gilbert.....	(q)	4-14-15	Municipal.....	Sanitary.....	Septic tank, dosing tank.....	Soil.....	None.....	
147	F-2	Glen Location.....	(m)	6-24-15	Mining Co.....	Sanitary.....	None.....	Creek.....	None.....	
148	F-2	Hartley Location..	(m)	6-24-15	Mining Co.....	Sanitary.....	None.....	Cesspool.....	None.....	
149	F-2	Leonicidas Location	(m)	6-25-15	Mining Co.....	Sanitary.....	None.....	Ditch.....	None.....	
150	F-2	Monroe Location..	(m)	6-24-15	Mining Co.....	Sanitary.....	None.....	Creek.....	None.....	
151	F-2	Morris Location..	(m)	6-23-15	Mining Co.....	Sanitary.....	None.....	Cesspool.....	None.....	

TABLE No. III—Continued
SEWERAGE SYSTEM INVESTIGATIONS, JANUARY 1, 1914, JANUARY—1, 1916

No.	Kind	Locality	Re-quested by	Date	Ownership	Type of System	Treatment	Discharged Into	Recommendations	Result of Follow-up
152	F-2	St. Louis Co.—Cont.	(m)	6-24-15	Mining Co.	Sanitary...	None	Ditch.	None	
153	F-2	Myers Location...	(f)	11-10-15	Sanat. Com.	Sanitary...	Imhoff tank.	Ground surface.	None	
154	F-2	Nopeming...	(f)	11-11-15	Sanat. Com.	Sanitary...	Imhoff tank.	Ground surface.	None	
155	F-2	Norman Location.	(m)	6-25-15	Mining Co.	None	None	Creek.	None	
156	F-2	Penobscot Location.	(m)	6-23-15	Mining Co.	Sanitary...	None	Creek.	None	
157	F-2	Pioneer Location.	(m)	6-27-15	Mining Co.	None	Septic tank.	Long lake.	None	
158	P-1	Pioneer Location.	(m)	12-14-15	Mining Co.	Sanitary...	Septic tank.	Long lake.	None	
159	F-2	Shaw Location.	(m)	6-26-15	Mining Co.	None	None	Long lake.	None	
160	F-2	Sheridan Location.	(m)	6-23-15	Mining Co.	Sanitary...	None	Cesspool.	None	
161	F-2	Shiras Location.	(m)	6-26-15	Mining Co.	Sanitary...	None	Ditch.	None	
162	F-2	Sibley Location.	(m)	10-14-14	Mining Co.	Sanitary...	Septic tank.	Long lake.	None	
163	F-2	Sibley Location.	(m)	6-27-15	Mining Co.	Sanitary...	Septic tank.	Long lake.	None	
164	F-2	Sibley Location.	(m)	6-27-15	Mining Co.	None	Septic tank.	Long lake.	None	
165	F-2	Soudan Location.	(m)	6-27-15	Mining Co.	None	None	Long lake.	None	
166	F-2	Stephens Location.	(d)	10-6-14	Municipal.	Combined.	None	Manganika lk.	None	
167	F-2	Wantless Location.	(m)	6-26-15	Mining Co.	Sanitary...	None	Ditch.	None	
168	P-1	Scott Co. Belle Plaine.	(k)	12-2-15	Municipal.	Sanitary...	None	Minnesota river	None	
169	F-1	Sibley Co. Arlington.	(i)	7-19-15	School dist. 69.	Sanitary...	Imhoff tank, dosing tank and filter.	Tile drain.	System and treatment.	Under consideration
170	P-1	Stearns Co. Kimball.	(q)	7-14-14	School district.	Sanitary...	Septic tank.	Soil.	None	
171	P-1	St. Cloud.	(q)	5-18-14	State.	Sanitary...	Imhoff tank, percolating filter, resetting tank.	Ditch.	None	
172	F-2	St. Joseph.	(p)	6-15-14	St. Benedict College.	Sanitary...	None	Pond.	System and treatment.	Nothing done
173	F-2	Stevens Co. Chokio.	(k)	11-25-14	Municipal.	Drain tile.	None	Ditch.	System and treatment.	Nothing done
174	F-2	Morris.	(p)	9-24-15	State.	Sanitary...	Septic tank.	Pomme de Terre river	System and treatment.	Nothing done
175	F-2	Swift Co. Kerkhoven.	(p)	11-24-14	School district.	Sanitary...	Septic tank.	Ditch.	None	

TABLE No. III—Continued
SEWERAGE SYSTEM INVESTIGATIONS, JANUARY 1, 1914—JANUARY 1, 1916

No. Kind	Locality	Re-quested by	Date	Ownership	Type of System	Treatment	Discharged Into	Recommendations	Result of Follow-up
176	Todd Co. F-2 Browerville.....	(i)	10-8-14	School district..	Sanitary...	Septic tank.....	Ground surface.	Treatment.....	Complied with
177	P-1 Staples.....	(g)	6-2-14	Municipal.....	Sanitary...	Screen, Imhoff tank, dosing tank.....	Creek.....	None.....	
178	F-2 Staples.....	(d)	11-3-15	Municipal.....	Sanitary...	Screen, Imhoff tank, dosing tank.....	Creek.....	Const. and operation..	Work in progress
179	Traverse Co. F-2 Browns Valley...	(b)	3-6-15	.....	None.....	.....	.....	Construction.....	Not complied with
180	Wabasha Co. F-2 Wabasha.....	(p)	8-31-15	.....	None.....	Imhoff tank, dosing tank and filter.....	.....	System.....	Under consideration
181	P-1 Wabasha.....	(r)	9-30-15	Sanat. Com.....	Sanitary...	.....	Ground surface.	None.....	
182	Wadena Co. P-1 Verdale.....	(r)	9-30-15	School dist. 5..	Sanitary...	Imhoff tank, dosing tank and filter.....	Soil.....	None.....	
183	Waseca Co. F-1 Janesville.....	(k)	11-14-14	Municipal.....	Sanitary...	Imhoff tank.....	Creek.....	System and treatment.	Nothing done
184	F-2 New Richmond...	(p)	8-10-15	Municipal.....	Storm.....	None.....	Creek.....	System and treatment.	Nothing done
185	F-2 Waseca.....	(l)	9-15-14	Municipal.....	Sanitary...	Septic tank.....	Clear lake.....	Const. and treatment..	Nothing done
186	F-2 Waseca.....	(k)	10-11-15	Municipal.....	Sanitary...	Septic tank.....	Clear lake.....	Const. and treatment..	No reply
187	Wilkin Co. F-2 Brckeledge.....	(k)	5-7-14	Municipal.....	Combined.	None.....	Other Tail river.	System.....	Postponed
188	P-1 Wolverton.....	(k)	3-13-15	Municipal.....	Sanitary...	Imhoff tank, dosing tank and filter.....	Ravine.....	System and treatment.	Under consideration
189	Winona Co. F-2 Lewiston.....	(l)	11-19-14	School dist. 22.	Sanitary...	None.....	Cesspool.....	Const. and treatment..	Plans submitted
190	P-1 Lewiston.....	(q)	8-2-15	School dist. 22.	Sanitary...	Imhoff tank.....	Cesspool.....	None.....	
191	F-1 St. Charles.....	(i)	9-22-15	School district..	Sanitary...	Imhoff tank, dosing tank and filter.....	Cesspool.....	System and treatment.	Plans submitted
192	F-2 St. Charles.....	(l)	12-20-15	Private.....	.....	.....	Cesspool.....	System.....	Nothing done

TABLE No. III—Continued
SEWERAGE SYSTEM INVESTIGATIONS, JANUARY 1, 1914—JANUARY 1, 1916

No. Kind	Locality	Re-quested by	Date	Ownership	Type of System	Treatment	Discharged Into	Recommendations	Result of Follow-up
193	Wright Co. F-1 Maple Lake.....	(k)	8-3-14	Municipal.....	Combined.	Imhoff tank filter, re-settling tank.....	Ditch.....	System and treatment.	Plans submitted
194	P-1 Maple Lake.....	(a)	10-4-15	Municipal.....	Semi-combined...	Screen, Imhoff tank...	Creek.....	None.....	
195	Yellow Medicine Co. P-1 Granite Falls....	(a)	7-20-15	Sanat. Com....	Sanitary...	None.....	Minnesota river	None.....	

(FOOTNOTES TO TABLE III)

Kind of Investigation:

- F-1—Field investigation, proposed system.
F-2—Field investigation, existing system.

Investigation requested by:

- (a) U. S. Treasury Department.
(b) State Legislature.
(c) Governor.
(d) State Board of Health.
(e) Interstate Park Commission.
(f) County Sanatorium Commissioners.
(g) County Superintendents.
(h) Board of Poor Commissioners.
(i) School Districts.
(j) Mayors.
(k) City or Village Councils.
(l) City or Village Health Boards.
(m) Mining Companies.
(n) Creamery Companies.
(o) Manufacturing Companies.
(p) Citizens.
(q) Consulting engineers.
(r) Architects.

- P-1—Plan examination, proposed construction.
P-2—Plan examination, existing construction.

Summary of Investigations on Sewerage Systems—Tables III includes summarized information on the investigations on sewage disposal problems during this biennial period. The following information has been obtained from the material found under the various subject headings in this table.

Number and Kind—One hundred and ninety-five investigations on sewage disposal problems were made for 156 localities, distributed over the state as shown on the maps given on pages 294 and 296. The kind of investigations included 106 on proposed sewerage systems and 89 on existing systems. The proposed systems involved field work in 52 cases. The existing systems required field work in every instance.

Requests—The following tabulation gives the sources of the requests for these investigations:

United States Government—	
Treasury Department	1
State Government—	
Legislature	1
Governor	1
Board of Health.....	9
Interstate Park Commissioner.....	1
County Government—	
Sanatorium Commissions	5
Superintendent of Public Schools.....	1
Board of Poor Commissioners.....	1
School Districts	32
Municipal Government—	
Mayors	3
Councils	13
Health Boards	16
Companies—	
Mining	29
Creamery	3
Manufacturing	1
Individuals—	
Citizens	25
Consulting Engineers	35
Architects	18
Total	195

The number of requests made for these investigations demonstrates the public demand for this kind of work for the protection of health and the prevention of nuisance in various communities throughout the state. It should be noted that a large number of requests have come from local authorities, and a still greater number from individuals. The large number of requests made by citizens was due to the fact that in many instances these persons were complainants against nuisances created by public sewerage systems. A large number of requests are indicated from consulting engineers and architects who sought approval on the installations which they were recommending to local authorities.

In addition to these, numerous requests were received from private individuals desiring information on the installation of systems for the disposal of sewage from residences and also seeking advice in regard to the proper disposal of human excreta. This information was given through correspondence or by furnishing bulletins on these subjects.

Ownership—The following tabulation of ownerships is of interest:

United States Government.....	1
State	8
County	71
Municipal	65
Company	39
Private	11
Total	195

It indicates clearly that the work is confined almost entirely to investigations on public sewerage systems or those which involved the disposal of sewage from more than an individual residence. It is apparent

that investigations on municipal and company systems exceeded those owned by any other parties. This is to be expected as the public sewerage system of any community is usually maintained by the municipality or a company.

Kind of Systems—The investigations on sewerage problems involved 182 systems, while the remaining 13 were undertaken to advise regarding the disposal of human excreta by other means. The following tabulation shows the kind of systems found:

Sanitary	160
Storm and surface water sewers and drains.....	12
Combined and semi-combined.....	16
	188

This tabulation shows a marked predominance in the sanitary type of system. This should not be taken to indicate that this is the most prevalent type throughout the state, for in the case of older installations unquestionably the other types predominate. It is also true that many of the investigations were on proposed systems and in these cases sanitary systems were recommended in practically every instance for the removal of house sewage.

Kind of Treatment—No treatment of the sewage was found in 54 existing systems, and no treatment was indicated in 9 proposed systems that were investigated during this period. The following tabulation shows that treatment was recommended or existed in 132 cases.

Kind of Treatment.	Prop.	Exist.
Imhoff tank	37	15
Imhoff tank with subsequent treatment.....	48	5
Septic tank	9	15
Septic tank with subsequent treatment.....	3	..
	97	35

On considering the proposed systems, it is evident that the type of treatment most frequently recommended or installed is a settling tank of the Imhoff type, with or without subsequent treatment, as the case may demand. The few septic tanks which appear under the proposed systems were in cases of very small installations or municipalities that insisted upon that type of treatment against the advice of this Board. The existing systems naturally show treatment with both types of tanks, as many of these installations were made previous to the time the Imhoff type of tank came into use.

Recommendations—In the following tabulation, the recommendations on proposed and existing sewerage systems have been classified under six general headings. One hundred and eighty-three recommendations were made for the correction or improvement of unsatisfactory conditions in the systems investigated.

Recommendation on—	Number.	Percent.
Treatment	80	43
System	66	36
Construction	23	12
Operation	10	5
Location	4	2

This table shows that the recommendations regarding the treatment and systems exceed all others. This is to be expected as a large number of these investigations are on proposed systems.

Some of the pronounced defects in sewerage systems noted in the investigations are as follows:

The design of systems, especially sewage treatment plants, without adequate information regarding the quantity and character of sewage to be treated.

The construction of combined and semi-combined systems where separate systems should be installed, by means of which storm water and house sewage may be removed in separate pipes. This is an important consideration in cases where treatment of the sewage is necessary.

The lack of attention in the operation of sewage treatment plants. Correctly designed plants become sources of nuisances and sometimes endanger public health when not intelligently managed.

The lack of attention in regard to the location, design, and construction of sewer outlets where the sewage is to be discharged into a running stream or a quiescent body of water. Outlets should be so constructed that the sewage will be diluted to the greatest possible extent.

The construction of individual septic tanks for private residences or public buildings, and discharging the effluent into tile drainage systems. This practice often creates nuisances and postpones the time when an adequate sewerage system can be constructed.

"Follow-up" Work on Investigations—The introduction of this report outlines the method used in systematically following up all investigations on which recommendations are made, in order to determine whether this advice is carried out. This work was begun during the early part of the period, but does not include all investigations on sewerage problems. The following tabulation shows the progress made in carrying out recommendations on 96 of the proposed and existing sewerage systems on which recommendations were made during this period:

	No.	Percent.
Recommendations complied with.....	36	38
Recommendations partly complied with.....	7	7
Work in progress.....	5	5
Work authorized.....	1	1
Work under consideration.....	10	11
Work postponed.....	4	4
recommendations not complied with.....	25	26
No replies to inquiries.....	8	8
	96	96

The above tabulation shows that in 38 per cent of the cases the recommendations were entirely complied with; in 28 per cent some steps have been taken to carry out the advice, while in 34 per cent no apparent effort had been made at the close of this period. These results show a fair rate of progress when it is considered that in many cases public funds must be raised before the work can be undertaken. It should also be remembered that a number of these investigations were made at or near the end of the period, hence the time was short in which to secure results.

GARBAGE DISPOSAL.

This Division has not been in a position to undertake a study of this problem, as there have been other problems of more pressing importance which have consumed the available funds. The proper disposal of garbage has public health significance. Garbage, when improperly cared for, provides an excellent breeding place for flies, which may carry infection from place to place. Therefore, the disposal of this material is worthy of consideration by health authorities. Garbage should be properly deposited in suitable containers, systematically collected at regular intervals, and disposed of in such a manner that it will not be exposed to flies. Very little attempt has been made in the smaller municipalities of the state to regulate its disposal. Most places have a municipal dumping ground where this material is deposited without any attempt at protection.

The study of garbage disposal problems should be a part of the routine work of this Division, as advice on this subject would be available to all municipalities throughout the state. This has been impossible on account of lack of funds, but it is hoped that future appropriations will be such as to permit the carrying on of these necessary investigations.

PUBLIC BUILDINGS.

This Board is required by law to examine plans relating to the sanitary arrangements of certain public buildings. Owing to lack of funds, the work of this Division during this period has been confined almost entirely to public school buildings. In these investigations it has been necessary to require local school boards to pay the field expenses involved. The following circular has been prepared, which defines the position taken by this Board in regard to this work:

"The health of school children depends in a large measure upon a safe water supply and a proper means of sewage disposal. In order that the children may be properly safeguarded in these respects, Section 2874, General Laws of 1913, provides that all plans of school buildings and their equipment shall be approved, and that the State Board of Health shall pass upon the safety of the water supplies and the adequacy of the sewage disposal systems. The expenditure of public funds as well as the State Aid which schools may receive is made dependent upon the approval of all plans, and this applies with equal force to all school districts, whether the systems are owned by the municipality, a private individual, or a corporation. It includes the means of the disposal of the sewage from a point where it leaves the school building until final disposal is made of the same.

"The work undertaken by the State Board of Health in order to assist school boards to obtain the approval is as follows:

"1. To inspect the site of new school buildings with a view of giving advice regarding the water supply and sewage disposal.

"2. To investigate the water supply, and if necessary in the case of existing water supply systems to make recommendations for changes in order to render the water safe for consumption.

"3. To investigate and make recommendations as to the type of sewage treating plant and the final place of disposal, and in the case of existing sewerage systems for changes, if necessary, in these systems.

"4. To undertake second investigations on the water supply or sewage disposal where a previous investigation indicated the necessity of reconstruction, or where the installation had not been made at the time of the first investigation.

"The State Board of Health does not furnish detailed plans and specifications. The plans and specifications for any new work are to be prepared by a competent engineer employed by the local authorities. The plans and specifications for any work on either water or sewerage should be submitted to the State Board of Health for examination and approval before any contracts are entered into.

"Owing to the restricted finances of the State Board of Health, it is not in a position to undertake investigations unless the local school board pays the traveling expenses incurred in this work. It is therefore necessary for local school boards to authorize such expenditures before the work can be undertaken by this Board."

GENERAL SUMMARY.

Amount of Work During the Period—The total amount work accomplished by this Division from January 1, 1914, to January 1, 1916, is shown in Table IV. All the subjects assigned to this Division have been included in this table, regardless of the work accomplished. This tabulation shows that the investigations are confined largely to water and sewerage problems. This is on account of the demands made by the people of the state for these kinds of work. The limited funds available have made it necessary to limit the work to a large extent.

TABLE IV

	Field Invest.	Plan Exam.	Laboratory Examinations				
			Micro.	Bact.	Phys.	Chem.	Spec.
Water supplies.....	390	12	2	2,360	424	424	88
Milk supplies.....	1			1,473			
Sewerage systems.....	138	57				17	
Garbage disposal public buildings.....		19					
	529	88	2	3,833	424	441	88

During this period 2,498 of the laboratory examinations included in the above table were made in the Duluth Branch Laboratory.

Increase in Routine Work—The increase in the routine work during the last three biennial periods on the subjects now assigned to this Division is shown in Table V. This table shows that the work has increased at a two-fold rate during each period:

TABLE V

Kind of Work	Biennial Periods		
	1910-1911	1912-1913	1914-1915
Field investigations.....	52	318	540
Plan examinations.....	6	11	88
Laboratory examinations.....	1,344	3,089	4,771
Total.....	1,402	3,418	5,399
Percentage increase over 1910-1911 period.....		143	285

The requests for investigations in 97 per cent of the cases have come originally from government officials, companies and citizens, and were not instigated by this Board. This is conclusive evidence that the people of the state are fast becoming aware of the dangers associated with improper sanitation and they are demanding that this work be undertaken for the protection of public health in their respective communities.

FINAL SUMMARY.

The duties assigned to this Division consist of investigations on Water Supplies, Milk Supplies, Sewerage Systems, Garbage Disposal and the sanitary arrangements of certain public buildings. During this biennial period 628 investigations were made on the subject assigned, which involved 4,771 laboratory examinations and required the staff to travel 58,625 miles within the state. The results of these investigations show that improvements or

corrections were necessary in 371, or 59 per cent, of all cases investigated before final approval could be given by this Board.

The requests for these investigations in 97 per cent of all cases came initially from local government officials, companies and citizens who were seeking advice for the protection of public health in their respective communities. These investigations aided in the protection of health among not less than 519,000 people.

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